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Disaster risk reduction and post disaster infrastructure reconstruction in Sri Lanka

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Research Institute for the Built and Human Environment
The University of Salford
Greater Manchester
United Kingdom

PROCEEDINGS OF THE BUHU 9TH INTERNATIONAL POSTGRADUATE RESEARCH CONFERENCE 2009

The Lowry, Salford Quays,
Greater Manchester,
United Kingdom
January 29 – 30, 2009

This is the proceeding of IPGRC 2009 of the Research Institute for the Built Environment, University of Salford which took place at the Lowry, Salford Quays, Greater Manchester, United Kingdom from 29th to 30th January 2009. The aim of this conference is to bring together Postgraduate Researchers to exchange and challenge research ideas and thoughts within a safe and professionally supportive environment.

The organising committee has selected a total of 74 contributions divided into 6 different areas or themes of interest:

Theme 1: Business, Economics and Finance
Theme 2: Design and Urban Development
Theme 3: Property and Project Management
Theme 4: ICT, Technology and Engineering
Theme 5: People, Skills and Education
Theme 6: Sustainability and Environmental Systems

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This conference originated as a part of the Research Institute for the Built and Human Environment (BuHu), University of Salford strategy for postgraduate research development.

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PREFACE

It is with great pleasure that we launch the BuHu 9th International Postgraduate Research Conference (IPGRC) in Salford Quays, Greater Manchester on 29 - 30th January 2009.

BuHu is the UK's top rated research institute for the built and human environment and is an internationally recognised centre for research excellence in the Built Environment with students from all over the world. In the latest Research Assessment Exercise (RAE 2008), BuHu has demonstrated to have the largest volume of world-leading staff (4* rated) in the Built Environment in the U.K.

This annual event has brought together over 80 delegates with 74 published papers from 12 countries. BuHu is indeed proud of being a home for national and international gatherings.

Getting published is an important challenge that all postgraduate researchers ought to face. It is a great sign of achievement and a flag for recognitions within the academic community.

The conference programme was carefully tailored to engage members of the academic community in order to enrich this two-day event with high quality session chairing, interactive panel discussions and postgraduate research workshops.

We hope that all the conference delegates will have a great time, and enjoy our 9th International Postgraduate Research Conference.

Prof Mustafa Alshawi

Director
Research Institute for the Built and Human Environment
University of Salford
Greater Manchester
United Kingdom

January 2009

INTRODUCTION

The International Postgraduate Research Conference (IPGRC) is an annual event that celebrates postgraduate research in the built and human environment discipline. The quality and diversity of the research papers submitted to this year event has demonstrated our discipline's ever growing boundaries and inherent complexity. Different research methodologies proposed in the papers have been applied to satisfy various research agendas. Many of the findings presented in the papers here will unquestionably lead to exciting and important innovation of the future. All of these are important indicators of our continuous attempt to improve our built and human environment through academic and collaborative research.

The editorial team has compiled seventy four papers from all over the world to be presented in the conference proceeding structured within six different themes. These papers represent the state-of-the-art research works in the built and human environment discipline. Some papers reported the very early stage of research whilst some other papers describe works in progress or closer to completion. Thus each article contributed to this proceeding in its own right.

The first theme is **Business, Economics, and Finance**. This theme embodies research papers relevant to the built and human environment in terms of the business, economical and financial factors surrounding the strategic decision making in the built and human environment. Papers included in this theme performed critical investigation on the enterprise and business level looking specifically at input and output of contractor firms, asset management in heath care sector, education institutions, and property market.

Subsequent to the evaluation of the business, economical, and financial factors, the second theme, **Design and Urban Development**, consolidates research papers concentrating on the realisation of the resulting decision. Papers in this category discusses extreme makeover of residential envelopes, courtyard as a design solution in hot climate region, combining methodologies in housing research, management of urban areas, urban regeneration, and sustainable urban development.

The third theme is **Property and Project Management**. This theme brings together research papers focusing on the property and project management aspects of the built and human environment. The level of the discussion here is mainly on the tactical and operational level. Even though the mainly operating on that level, the breadth of this theme span from knowledge transfer, knowledge management, facilities management, supply chain management to project management including health and safety.

The fourth theme is **ICT, Technology, and Engineering**. Research papers grouped into this theme mainly explore the means of providing supports on the strategic, tactical, and operational level discussed in the first three themes. This includes specific engineering application of simulation and modeling, knowledge representation and modeling, the development of knowledge repository and retrieval system, knowledge transfer practices and strategies, and advancement of web technology.

The fifth theme is **People, Skills, and Education**. The human dimension is the centre of discussion in this theme. This encompasses the advancement of human resource through capacity building and strengthening, improving manpower capability, empowerment, education and empowerment. Further, the issues within leadership, motivation, and careers as well as the influence of culture, communication, organisation structure, and the human dimension in e-learning and e-readiness are also discussed in the research papers included in this theme.

The final theme is **Sustainability and Environmental System**. This theme presents research papers reporting studies in search for sustainable materials and techniques. This includes optimization of recycled aggregates, the potential use non-metallic reinforcement, investigation on environmental impact of stabilising fluid, codes for sustainable homes, building sustainability rating index, sustainability knowledge and BREEAM index, decentralized alternative energy sources, and disaster risk reduction.

The papers presented in this proceeding have followed a review process and have been scrutinised by members of the scientific committee. Finally, the editorial team wish to forward a thankful remark to all parties that have contributed to the all activities leading to the completion, of this proceeding book. The compilation of research papers in this proceeding book has unquestionably contributes to the body of knowledge in the built and human environment and any other relevant disciplines.

The Editors

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Theme 1

Business, Economics and Finance

Effects of Extreme Weather Events on SMEs: A Literature Review and Synthesis

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Abstract:
Small and Medium-scale Enterprises (SMEs), which generate more than one half of the employment (58.9%) and turnover (51.9%), form an important sector of the UK economy. Although they are the main drivers of the UK economy, they are also said to be the most vulnerable to the impacts of Extreme Weather Events (EWEs). The world in recent years has experienced a significant number of EWEs, and SMEs have suffered significant economic losses as a result. The now apparent climate change, which is mostly attributed to human interference with the environment over the past few decades, is believed to have a strong link with the increase of EWEs in the recent past. Threats of EWEs are expected to further increase due to their increased frequency and magnitude and increased vulnerability to their effects. Interestingly, EWEs seem to present businesses with various business opportunities and positive consequences as well, besides the much feared and overwhelming threats and negative consequences they present. Understanding such impacts has become a necessity to improve the resilience of SMEs so that they will be better prepared to minimize the negative consequences and maximize the positive consequences posed by EWEs. This paper attempts to bring together and evaluate the current knowledge with regard to the effects of EWEs on SMEs. The paper establishes the case for more in-depth study with this regard and concludes by stressing the need for improving the resilience of SMEs to EWEs.

Keywords:
Business failure, Climate change, Extreme Weather Events, SMEs

1 Introduction

The world in recent years has witnessed increases in the intensity and frequency of EWEs (Beniston and Stephenson, 2004; Thibault and Brown, 2008). Evidence shows that there has been a long-term upward trend in the number of EWEs since the latter part of the 20th century (Munich Re, 2006), which has experienced over 170 “billion-dollar events” related to weather extremes, in particular windstorms, floods, droughts and heatwaves (Beniston and Stephenson, 2004). There is wider speculation that this

increased intensity and frequency of EWEs is primarily due to intensified climate change and that there is a strong link between the two (Stern, 2007). Thus, EWEs are expected to further increase in number and severity in future, due to the impacts of climate change (Environment Agency, 2005; Munich Re, 2007; Stern, 2007).

These EWEs can produce severe impacts on society and the environment (Easterling et al, 2000b; Nicholls and Alexander, 2007). Recent years have seen a number of weather events causing large losses of life as well as a tremendous increase in economic losses (Easterling et al, 2000a). Consequently, the cumulative economic and social costs of extreme weather related events have been increasing around the globe (McBean, 2004; Tompkins, 2002). Munich Re group (2006, 2008) confirms that economic and insured losses due to EWEs have gradually increased over the last few decades, after analysing data since 1950. Figure 1 shows the overall and insured losses due to "great weather disasters" (events with high overall monetary losses and/or with a large human impact) since 1950, which confirms the trend of increasing losses due to weather related disasters.

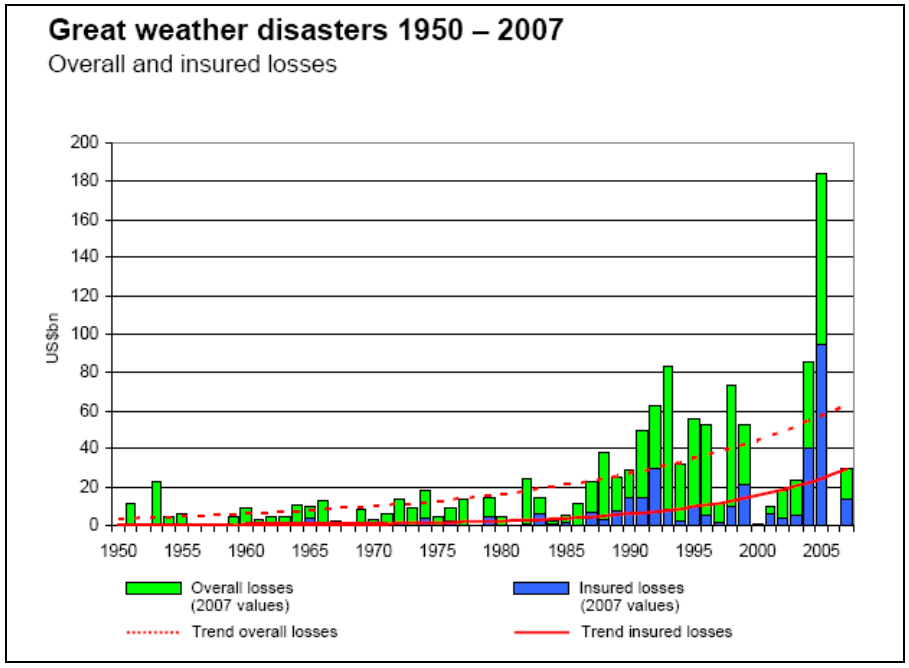

Figure 1. Overall and insured losses due to great weather disasters since 1950 (Source: Munich Re NatCatSERVICE, 2008)

Although many tend to attribute the increased costs primarily to increased intensity and frequency of EWEs, some argue otherwise. McBean (2004) puts forward that there is some debate over how much of this past increase has been due to social factors and how much due to changes in frequency or characteristics of extreme events. Kunkel et al (1999) argue that the increasing losses are primarily due to increasing vulnerability arising from a variety of societal changes, including a growing population in higher risk coastal areas and large cities, more property subjecting to damage, and lifestyle and demographic changes subjecting lives and property to greater exposure. Therefore it seems that both the increased vulnerability and increased number of EWEs have contributed towards the increased costs.

Despite the presence of debate as to what are the exact causes, it is evident that society as a whole has become more prone to suffer the effects of EWEs both economically and socially. SMEs, being a major stakeholder in any economy, also have to suffer the effects of EWEs, perhaps at a higher magnitude than their larger counterparts. Therefore, it has become a necessity to improve their resilience to EWEs. First it is required to obtain a greater understanding of the effects of EWEs on SMEs in order to arrive at ways and means of coping with them successfully.

This paper presents a literature review on effects of EWEs on SMEs, with the aim of obtaining a background understanding of such effects. The objectives of the paper are to establish the need to focus on SMEs with regard to EWE impacts and to identify their effects. The paper is organised in such a way to facilitate achieving these objectives. First, the need to focus on SMEs is established before going on to discuss the effects created on them by EWEs. Thereafter both the negative and positive effects of EWEs are discussed and the directions for future research are identified. Finally, the conclusions drawn are presented.

2 Why Focus on SMEs?

SMEs constitute the majority of business establishments responsible for the majority of jobs created and account for one-third to two-thirds of the turnover of the private sector in any economy (Gibb, 2004). In the UK, 99.9% of private sector enterprises are SMEs and they account for more than one-half of employment and turnover (BERR, 2007b). Statistically, SMEs have generated 52% of turnover and 59% of employment in the year 2006 (BERR, 2007a). SMEs are thus considered as the backbone of the UK economy (Crichton, 2006; Lukacks, 2005) due to their significant economic importance.

SMEs create entrepreneurial spirit and innovation and thus are crucial for fostering competitiveness (European Commission, 2006). Tilly and Tonge (2003) state that SMEs make important contributions to the UK economy in terms of technological progress, increased competitiveness, creation of new jobs and the economic revival of certain regions. Furthermore, SMEs are often said to contribute to a more equal distribution of income and wealth (Hallberg, 2000). They often represent the early stages of large enterprises, which grow further to reach a higher level. All these factors add more weight to the economic importance of SMEs.

Despite their significant economic importance, SMEs are considered as the most vulnerable section of the UK economy to the impacts of extreme weather (Crichton, 2006). Their vulnerability arises virtually by definition from the small scale of their human and financial resources (Bannock, 2005). Therefore, while extremes affect both large firms and SMEs equally, they may affect SMEs disproportionately hard (Finch, 2004; Tierney and Dahlhamer, 1996). On the other hand, since a majority of SMEs are local in their operations and rooted in local communities (Bannock, 2005), their owners are often hit twice by EWEs; as local citizens and as business owners (Runyan, 2006).

Added to the increased vulnerability, previous studies show that many small businesses are ill-prepared for recovery after a disaster (Yoshida and Deyle, 2005). Thus, SMEs may have to face severe consequences if and when they are affected by an EWE. In fact,

Cumbie (2007) avows that they are highly vulnerable to failure after a disaster. A previous study (Wenk, 2004) states that 43% of companies experiencing a disaster never reopen, and that 29% of those remaining close within two years. The economic impacts associated with such business failures will undoubtedly be substantial. While the loss of an individual SME may not cause a significant impact on the local economy in terms of the earnings it generates or the number of people it employs, the collective losses of a number of small businesses from natural disasters may devastate a local economy (Yoshida and Deyle, 2005). Despite the presence of these issues, disaster management literature has not dealt in depth with small business response to disasters (Alesch et al, 2001; Runyan, 2006; Tierney, 1994). Thus, the combination of all these: significant economic importance of SMEs; their increased vulnerability to EWEs; and dearth of research focused on SME resilience to EWEs, justify the focus on SMEs.

3 Effects of EWEs on SMEs

Though the effects of EWEs tend to be negative in many obvious ways, for some systems in some areas, extreme events are beneficial (Meehl et al, 2000). This is the case with businesses as well. Thus it is intended to discuss both the negative and positive effects of EWEs here. Most of these impacts are drawn in from climate change and disaster studies as only a very few number of studies are available with regard to EWEs and businesses.

3.1 Negative effects on SMEs

A recent report by Heliview Research (2008) reveals increase in total cost and decrease in turnover as the main negative consequences suffered by European businesses due to EWEs in the year 2007. It further reveals damage to buildings and other tangible assets, productivity losses, extraordinary costs and less profit as the other main negative consequences. Figure 2 shows the findings of the study with regard to negative consequences experienced by businesses in 2007. More importantly, the study has enabled the identification of a range of negative impacts that EWEs create on businesses, in a European context.

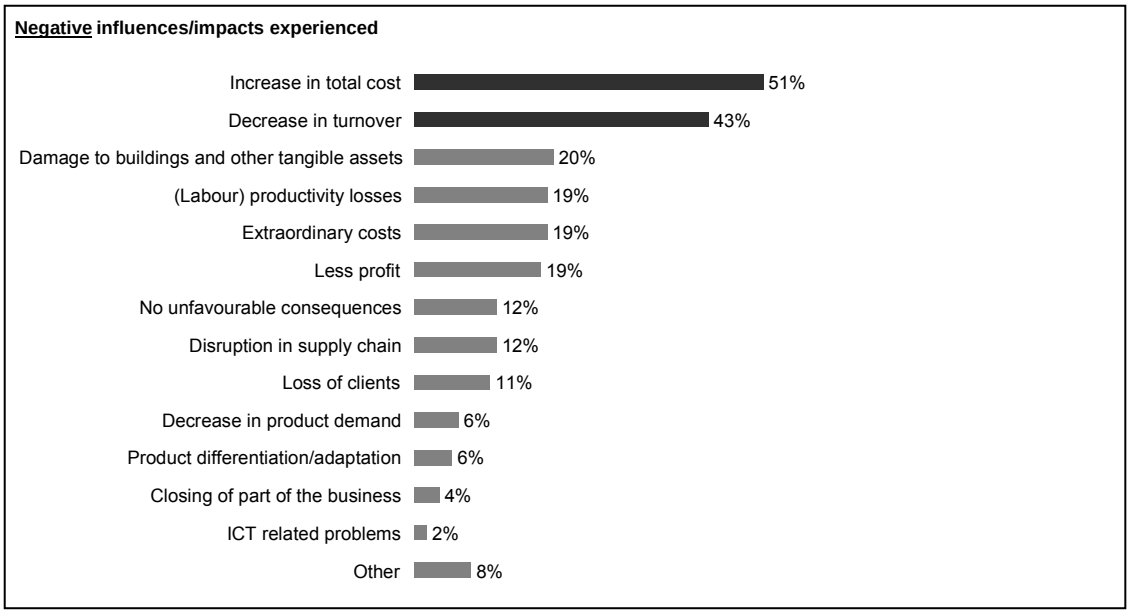

Figure 2. Negative influences experienced by businesses due to extreme climate events.
(Source: Heliview Research, 2008 pp 17)

Burnham (2006) also reveals increased costs and loss of revenue as the main risks that the businesses have to suffer due to EWEs. Increased costs may arise in many different ways. These may include, but are not limited to, higher costs of transportation, costs of alternate supply of goods and services, costs of premises improvements/relocation etc. On the other hand, SMEs may have to forgo sales revenue due to business shutdown, reduced sales, productivity losses etc. They may also have to suffer increased costs and loss of sales revenue due to the vulnerability of the supply chain, utilities and transport infrastructure (Burnham, 2006; Tierney, 1994). Businesses may not be able to receive supplies in time and may not be able to deliver goods on time due to the effects of EWEs such as flooding, storms and extreme rains.

Another recent study conducted on behalf of Climate South East (Norrington and Underwood, 2008) reveals that damage to property/stock and reduced customer visits/sales are the most experienced negative EWE impacts by South East SMEs in the past two years. Furthermore, it is now widely agreed that the risks of blackouts and damage to property and inventory from EWEs are increasing (AXA Insurance UK, 2008). Damage to business premises or contents can affect the ability of a business to survive, not only because of lost sales or lost production hours, but also because of increased costs such as alternative premises, overtime etc (Association of British Insurers, 2008). Furthermore, damage to property may create business disruptions, eventually giving rise to more costs. The impacts of business interruption include the costs of replacing or repairing the assets, the loss of revenue during the disruption period as a result of inability to produce and sell particular products and complementary products, and loss of revenue from all products due to perceived loss of quality etc (Aba-Bulgu and Islam, 2007). For an SME, these costs can be substantial.

On top of the initial direct loss of cash flows, SMEs may also experience other forms of crises such as loss of market share, loss of key personnel, loss of production efficiency, withdrawal of supplies, withdrawal of licences, and loss of quality/standard

accreditation and so on (Aba-Bulgu and Islam, 2007). Tierney (1997) puts forward that, in addition to direct physical impacts and the interruption of critical utility services, disasters cause business losses by affecting productivity in other ways, for example, by disrupting customer traffic and causing problems for employees. It is further revealed that losses escalate when employees cannot come to work because of transportation and other problems, when owners must suddenly cope with losses both at home and within the business, when customers cannot purchase goods and services, and when the flow of supplies and materials is disrupted.

EWEs driven by climate change such as extreme temperatures, extreme rainfall etc, may create decreased demand for certain goods and services. Loss of traditional markets, loss of local competitive advantage and new competition in existing markets for agriculture sector industries can be cited as an example (Metcalf and Jenkinson, 2005). Some regional industries may suffer due to the enhanced position of competitors in other regions. SMEs operating in such vulnerable business activities may be adversely affected. Businesses which do not apply adaptive measures against weather extremes may face the risk of attracting and retaining staff due to their reputation as a poor employer (Metcalf and Jenkinson, 2005). Furthermore, climate change impacts might result in the relocation of workers, or changes in commuting patterns (London Climate Change Partnership, 2002). Businesses may face problems with regard to these issues.

Difficulty in securing finance and obtaining insurance cover at reasonable cost are also negative effects that SMEs may have to face (Metcalf and Jenkinson, 2005). The investors and credit suppliers will be reluctant to supply finance (Metcalf and Jenkinson, 2005) and the insurers will quote a higher premium for cover if the possibility of damage to a business due to an EWE is high (Dlugolecki, 2004). Further to that it is expected that the insurance premiums that deal with weather losses will increase in general due to the increased risk of EWEs (Association of British Insurers, 2005). In addition to the costs of higher premiums, this might cause another severe risk to SMEs. As the costs are high, they may tend to underinsure their assets, leaving them vulnerable to further losses in case of an EWE, hence creating a vicious cycle. AXA insurance (2008) reveals that 90% of small businesses are underinsured even now. SMEs may tend to further underinsure their assets due to higher insurance costs. The businesses, particularly SMEs in which the power of negotiation is less when compared with large-scale organizations, will have to suffer losses because of these reasons.

Alesch et al (2001) have found that only the weakest small businesses fail right after a disaster. They reveal that many owners continue to struggle to recover until, one by one, their resources, energy, and their options are exhausted, leading to more economic and social losses. Therefore, EWE-struck SMEs who struggle to recover but fail ultimately may have to suffer further losses in addition to their initial ones.

The above discussion conceals some of the negative impacts that SMEs may face due to EWEs in general. The amount of losses suffered by individual organizations may vary to a great extent depending on many factors. As an example, Webb et al (2002) state that businesses in crowded, highly competitive, and relatively undercapitalized economic niches appear to have the most serious problems. Alesch et al (2001) point out that the initial losses experienced by a small business depend on four factors: exposure; vulnerability; intensity and the duration of the event; and amount of warning

time available. Furthermore, the effects may vary according to the type of EWE and the industry sector that it operates in and the locality (Metcalf and Jenkinson, 2005). Thus, it is necessary to identify these impacts on a case by case basis.

3.2 Positive effects on SMEs

Certain weather extremes may present businesses with new business opportunities. Extreme high temperatures such as the 2003 heatwave are expected to give rise to opportunities such as pavement cafes, fiestas, and higher sales of food and drink products (Metcalf and Jenkinson, 2005). Furthermore, consumer behaviours may change significantly due to their perceptions regarding weather changes. Changing markets, customer needs and investor expectations will present significant opportunities for businesses (Firth and Colley, 2006). Specific industries like flood defence and environmental services may be affected favourably due to the EWE. Industries like construction will also benefit from extreme weather, due to the increased need for reconstruction and more robust structures (Dlugolecki, 2004). Although such increased demand is seen as a positive consequence, excessive demand over and above the normal production capacity may also create some problems. For an example, Ingirige et al (2008a) mention that excessive demand for reconstruction in Sri Lanka after the impact of the South Asian tsunami in 2004 fuelled inflationary price increases within the whole industry. Thus the SMEs will have to be careful of such effects associated with demand increases after an EWE.

Webb *et al* (2002) state that because disasters produce reconstruction booms and allow community improvements to be made rapidly, rather than gradually, they create windows of economic opportunity. Citing Skidmore and Toya (2002) they further declare that "recent cross societal research on the macroeconomic impacts of disasters suggests that climate-related disasters have long-term positive economic consequences related to physical capital, human capital, and productivity". Thus, SMEs will also benefit from rapid economic developments in the locality, if it is in a position to capitalize on the favourable conditions.

SMEs who successfully survive an EWE may experience increased customer loyalty, new customers, cost savings and additional sources of revenue (Holmes, 2006). They may also be able to enjoy enhanced staff attraction and retention by improving working conditions for staff by climate proofing the work premises and ensuring that the premises are comfortable to work in (London Climate Change Partnership, 2005). Furthermore, a well-resilient business against probable EWEs will be able to enjoy reduced insurance premiums, secured investment opportunities and stakeholder reputation, all of which contribute towards business success.

Alesch et al (2001) have found that the weaker small businesses tend to fail right after a disaster. They also reveal that many small firms on the edge of failure often tumble when the event strikes, even if they only suffer marginal damage. Businesses making losses may also be triggered by EWEs and consider moving or closing even without suffering damages. From an economist's point of view, the failure of such firms will reduce further unnecessary costs to both the owners and society. Thus it can be regarded as an indirect benefit for the business owners as well, as they can avoid further losses.

Metcalf and Jenkinson (2005) have identified a range of threats and opportunities created by climate change on businesses under seven major elements of a business. Some of the impacts identified in the report are related to EWEs. Table 1 show the EWE related impacts extracted from their report.

Table 1. Threats and opportunities to businesses arising from EWEs

(Adapted from: Metcalf and Jenkinson, 2005)

Business area	Threats	Opportunities
Logistics	• Vulnerability of supply of goods and services • Disruption to utilities • Vulnerability of transport and delivery systems	• Maintaining supply and transport of goods and services through awareness and adaptation planning • Creating secure systems of water storage and electricity generation on site
Finance	• Difficulties in securing investment and/or insurance cover at reasonable cost • Potential liabilities if EWE risk is not factored into long-term decisions	• Reputation with all stakeholders • Security for investment • Reduced insurance premiums
Markets	• Decreased demand for certain products • Competitors' position enhanced by weather extremes	• New products or modifications to existing ones • Become an early mover in response to changing markets
Process	• Increased difficulties or entirely new problems due to extreme temperatures, storms, and rain	• Some aspects of production process or service delivery made easier specially due to temperature extremes
People	• Threats to working conditions and travel arrangements • Failure to attract or retain staff through reputation as poor employer	• Improve working conditions and travel arrangements for staff • Reputational opportunities as good employer
Premises	• Vulnerability to flooding, storms and rain • Challenge of copying with temperature extremes	• Maintain, manage and re-furbish premises • Optimise location of premises
Management implications	• Business failure or reduced profits	• Proactively manage impacts and adaptation issues • Mainstream EWE impacts and adaptation into business activities

Since the focus of their study is primarily on climate change, the contents of the table have been adjusted to better reflect the effects of EWEs. Most of the threats identified here have been discussed under the previous sub-heading. The opportunities identified by them reveal that especially the businesses that plan for probable EWEs and manage them successfully may enjoy positive business opportunities as opposed to the negative impacts. Thus, the need for improving SME resilience and adaptive capacities to EWEs so that they will be in a better position to cope with EWEs emerges.

4 The Way Forward

Although the scant amount of literature available limits comprehensive understanding, the facts discussed above show that EWEs pose considerable negative impacts as well as some positive impacts on SMEs. These impacts necessitate SMEs to be prepared to minimize the effects of negative impacts on themselves and also to capitalize on the positive impacts. In spite of higher vulnerability to these crisis impacts, the SME sector is renowned for being least prepared for such events (Ingirige et al, 2008b). There is thus an obvious incentive to focus on research related to SME resilience to EWEs. Improving the resilience of SMEs is not only about understanding problems confronted by them but it is also about gaining a better understanding of how to overcome them (Tilley and Tonge, 2003) and how to integrate best practices into the mainstream of SME activities, so that they will be in a better position to manage the risk in case of an EWE.

We intend to undertake extensive research on SME resilience to EWEs, addressing this research potential and requirement. In a broader sense, the aim of the proposed study would be to develop a decision making framework that supports SMEs to improve their resilience to EWEs. Essentially, in order to achieve this aim, a major objective of the study would be to gain a comprehensive understanding on effects of EWEs on SMEs, SME coping strategies, their adaptive capacities and resilience, and barriers to implementing various coping measures. Other objectives of the study would include understanding the decision making process of SMEs, and developing and testing a decision making framework that supports SMEs to improve their resilience to EWEs. These objectives will be further refined as the study progresses. The study will involve a comprehensive literature review covering many facets of the research issue identified above. This will be followed by a questionnaire survey targeting a considerable SME sample and a series of interviews targeting a fewer SME sample. The decision making framework to be developed will then be tested with the participation of a target SME sample. This paper acts as an initial literature survey in this regard and fulfils the objective of obtaining a background understanding on effects of EWEs on SMEs.

5 Conclusion

The SME sector is considered the backbone of the UK economy due to its significant economic and social importance. The sector is also considered as the most vulnerable section of the UK economy to the impacts of EWEs. Successful operation of the SME sector has been challenged by the increased intensity and frequency of EWEs coupled with increased vulnerability to EWEs, during the recent past. EWEs are capable of creating significant negative impacts on SMEs, especially due to their inherent characteristics such as resource constraints and local presence etc. Interestingly, EWEs seem to present businesses with some positive consequences as well. The exact effect on individual businesses seems to depend on a variety of factors including exposure, vulnerability, type of EWE, intensity and duration of the event, the industry sector that it operates in and locality etc. Consequently, it is difficult to identify a comprehensive list of effects on SMEs due to these variations and also due to the scant amount of literature available with regard to this subject. Thus the paper identifies the need for

conducting more in-depth study to investigate these impacts in order to gain a comprehensive understanding.

The factors like economic and social importance of SMEs, their higher vulnerability to EWEs, significant negative effects on them and potential positive opportunities available, all contribute towards the growing need for enhancing their adaptive capacities to deal with EWEs. This paper thus highlights the importance of improving SME resilience to EWEs. Although the need is ever increasing, matters like ways and means of achieving SME resilience to EWEs and barriers to implement them practically seem to be still in the dark. The need for further study with regard to SME resilience to EWEs is also escalating. The paper also provides fundamental background information for a comprehensive study to follow on SME resilience to EWEs, which is to be undertaken to address gaps in knowledge mentioned above. In addition, the paper leads to further studies aimed at identifying existing coping strategies adopted by SMEs in order to manage the consequences discussed.

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Industrialised Building System in Malaysia: Issues for Research in a Changing Financial and Property Market

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Abstract:
Industrialised Building System in its different guises appears to have gained popularity in recent years. Through a thorough review of literature, this paper presents a historical appraisal of the definitions offered for the different guises of IBS, the characteristics of IBS, and the benefits it purports to offer. In the same vein, the factors that have fuelled the popularity of IBS is discussed together with the impact of the changing financial and property market crisis on the future of IBS. The implications of the current financial and property market prices on IBS in Malaysia shall also be discussed. The paper concludes by drawing inferences on the implications of the current financial and property market crisis on research in IBS from a Malaysian construction industry perspective.

Keywords:
Financial Market, Industrialised Building System (IBS), Malaysian Construction Industry

1 Introduction

The Industrialised Building System (IBS) is a method of construction developed due to human investment in innovation and on rethinking the best ways of work deliveries. There are two main construction methods which are 'modern' and 'traditional' (Navarro, 2002). The two methods generally operate independently. More over, the modern method is normally associated with technological progress while the traditional method is often undervalued and underdeveloped (UNIDO, 1980). The common benefits such as time cost and quality performance have been known as general advantages. These may influence the selection and implementation of IBS as one of the best alternative methods of construction. The development of IBS is due to innovative factors and the need to create more sustainable construction environment. Most industries import innovation from other industries to supplement their own research and development (R&D). However, due to under investment in R&D, construction industries in some countries such as UK, will be more dependent on the importation and adaption of the products of other industries (Torrance, 1997). The paper will discuss the definitions and classification of IBS. The main content is the characteristics and benefits

gained from the implementation of IBS. The factors that make significance contribution in the fuelled IBS popularities also will be discussed with the effects of IBS in Malaysian construction economic and financial situation.

2 Literature Review

2.1 IBS : Issues of Definitions and Classifications

It has agreed and accepted that IBS do not have the specific term and definition (Hamid et al., 2008). IBS can be defined as an investment in equipment, facilities, and technology with the purpose of increasing output, saving manual labour, and improving quality (Warszawski, 1999). IBS or Offsite in particular is a process which incorporated prefabrication and preassembly that involves design and manufacture of units or modules, usually remote from the work site, and their installation to form the permanent works at site (Gibb, 1999).

Construction Industry Development Board in Malaysia Roadmap of IBS (CIDB,a, 2003) defines IBS as construction techniques in which components are manufactured in a controlled environment (on or offsite), transported, positioned and assembled into a structure with minimal additional site works. However, in Malaysia, IBS was described as a system which uses industrial production techniques either in the production of components or assembly of the building or both (Parid, 1997). Meanwhile, (Trikha, 1999) discusses IBS as a system of construction that has been made to be mainly industrialised in a manner and process, such as the manufacturing of automotive components and furniture. Then, he defines the IBS as a system in which concrete component prefabricated at site or in factory are assembled to form the structure with minimum in site construction (Trikha, 1999). An IBS also is defined as a mass production of building components either in factory or on site according to the specification with standard shape and dimensions and transport to the construction site to be re arranged with certain standard to form a building (Chung and Kadir, 2007).

Even tough the term of IBS was inconsistency defined by different authors, the general element of IBS term was developed based on categories which can be classified as pre, building system, modern construction, advance automation and volumetric construction. In the UK, the term of IBS can be classified into four major classifications which are known as Offsite [OS], Pre [PRE], Modern Method [MM] and Building. The term Offsite comprises of Offsite production [OSP], Offsite Manufacturing [OSM] and Offsite Fabrication [OSF], (Pan, 2006). While the terminologies of Pre can be expanded for Pre-assembly, Pre-fabrication, pre-fabulous and Prefab. The Modern category includes the Modern Method of Construction [MM], Modern Method of House Construction and Modern Method of House Building. The fourth category of terminology is Building which comprises of the System Building, Non Traditional Building and Industrialised Building.

The classification of IBS in Malaysia was based on structural building systems or elements. It can be divided into four major sub structural systems known as Conventional System, Cast in Situ Formwork System, Prefab Panel System and Combination Composite System (Kadir et al., 2006)

2.1 Characteristics Issues in IBS

The literature review shows that modular component element is the most popular characteristic and element in each identified system of construction method of IBS but factory production base is the second element which is classified as the IBS main characters. The prerequisites to be characterized as IBS are centralization of production, mass production, standardization, specialisation, good organisation and integration (Warszawski, 1999). How ever, the standardisation and mass production is the other characteristic which has been commonly agreed by several authors. The characteristics of IBS as presented in Table1 below highlights the general elements of IBS.

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Authors	Characteristics							
	Factory Base (Off Site) Production Techniques	Mass Production	Site Erecion and Pre Assemblies	Modular Component Elements	Standardisation	Labour Reduction	Modern Metho d	Automation Manufacturing
Parid, W., 1997	X							
Trikha, D.N., 1999	X	X		X		X		
Gibb, A., 1999	X	X	X					
Warszawski, 1999	X		X	X	X			
Ingemar, L, and Gylltcft K 2000		X					X	X
Kadir, M.R.A., et al., 2005	X	X		X		X		
Marsono, A.K et al., 2006	X				X	X		

Table 1: Characteristics of IBS

2.3 Issues of Benefits in IBS

Many authors highlight the benefits of IBS in different views of analysis. In order to obtain the specifics comparison benefits of the overall implementation of IBS seems to be difficult because the type of IBS used is different between organisations, projects, natures and characteristics of construction industry. Hence, generally, the study found that benefits can be obtained from the implementation of Offsite Production (OSP) or IBS such as speeding time, factory quality production, lower cost and less risk, highly productivity, less people or workers and process driven (Gibb, 1999).

However, it can be perceived as traditional benefits, if the indicators such as time, cost and quality have been used (Warszawski, 1999). Then, he makes a thorough analysis of benefits and concludes that savings in manual labour on site is up to 40 to 50 percent of input in conventional construction. The advantages from the comparison between conventional building and modern methods have been discussed especially in skilled trades such as formwork, masonry, plastering, tiling and services.

In Malaysia, the few researches and studies show similar findings with most of the manufacture brochures in 1999 highlighted the advantages and benefits of IBS in term of cost effectiveness. The study on the cost comparison between fully prefabricated building and conventional building shows the result that the cost of building system for single storey houses is much higher then conventional building (Haron et al., 2006). Cost of gross floor area (ft2) used to achieve to make a comparison basis is questioned because of the arising issues whether a similar building design and site location within concurrent starting activities had been done to make a fair comparison. However, other

factors contributed in cost control of IBS. Consequently, there is a significant factor of cost effectiveness contributing towards the cost control problems. The factor varied between the projects stakeholders. The contractor shows the highest parties in project stakeholders which influenced the most significant factors. It is followed by consultants, client and project characteristics itself (Lew et al., 2003).

While listed are the advantages or benefits of IBS as in temporary works, labour saving in numbers, faster construction time and flexible in design and construction (Trikha, 1999). The points discussed are focussed on the economical aspects in elimination of traditional formworks system which is pending on the climates changes especially for concreting works. The saving of labours requirements and time consuming have been discussed with the design advantages. It can be argued that time and cost saving has not been supported by a thorough analysis and comparison that really shows the benefits gained by IBS implementation. But, in term of productivity, there is a study that found the advantages of precast (IBS) is better than conventional cast in situ (Gunawan, 2005). The others advantages of IBS as speed of construction, saving in labour, optimising material use, better quality, less prone to weather changes and cost effective (Samad and Ali, 1998).

The common benefits of IBS from the others studies are repetitive use of formworks system will reduce cost (Thanoon et al., 2003; Bing, 2001). The operation of construction is independent from weather condition due to prefabricated components in factory (Peng, 1986). On the planning aspect, the concurrent activity of component preparation and installation will reduce the construction time and capital outlays (Peng,1986). From the perspective of design matters, the flexibility in design of precast element and construction will produce specific and unique design of prefabrication construction methods (Zaini, 2000). The benefits gained from the IBS implementation also can be reviewed during the production of precast components which attaint from the selection of materials, technology used and quality assurance control (Din, 1984).

However, the first Malaysian IBS project in Jalan Pekeliling, Kuala Lumpur which was awarded to Gammon/Larsen Nielsen using the Danish system with large panel prefab system showed 8.1% higher than conventional building system costs (Thanoon et al., 2003).

The timing issues of beneficial study as concluded in figure 1 shows that OSF or IBS shall be started at an early stage of project implementation, i.e. initial stage (Gibb, 1999). The project strategy shall be agreed upon for IBS promotion and benefits gained. By doing the right selection of construction methods at initial stage, the results and advantages of IBS as discussed above will be achieved accordingly. In order to represent the influence of decision making factor in the selected IBS or OSF as construction method, the following figures show the relationship as the project phases out.

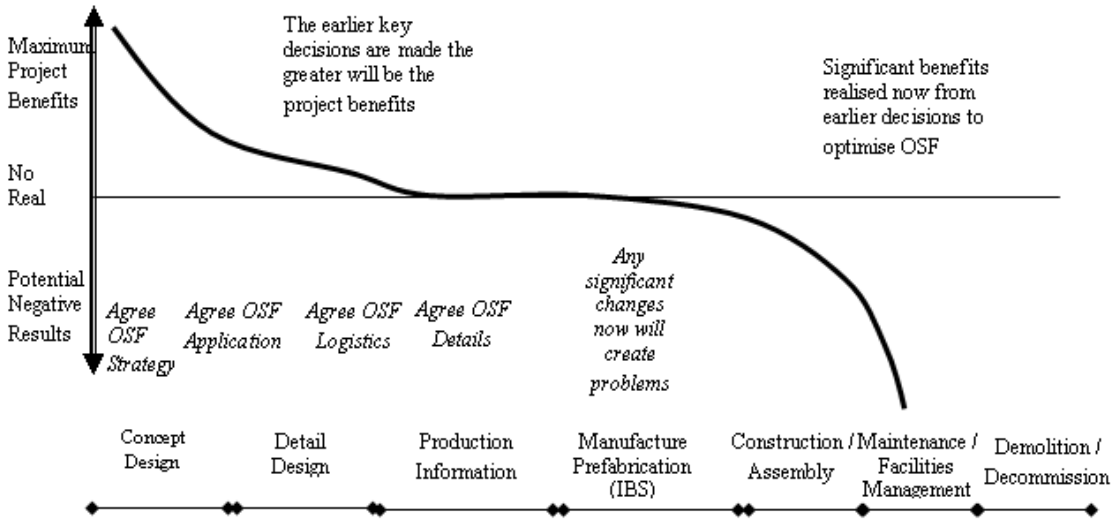

Figure 1: Timing of key off site fabrication (OSF) or IBS
decisions to maximise project benefits.
Sources adopted from Gibb, Off Site Fabrication, (Gibb, 1999)

2.4 Issues for Factors Fuelled the Popularity of IBS

2.4.1 Economy Development

In the world economy scenarios, since the late 1960s, global construction activities have become more concentrated within the richer industrialised countries (Drewer, 2001). Furthermore, during this same period it could be argued that an international construction system emerged is dominated by practices, contractors and material producers as well as by technologies and procedures originated in these same countries. Consequently, the richer countries dominate somewhere between 80% and 90% of all global construction activity either directly or indirectly through their contractors, design consultants and materials producers. One explanation for their dominant role is their collective economic strengths. However, it is also a function of the technologies currently used internationally to realise a complex array of delivering building and civil engineering facilities. The only internationally traded category of construction resource where the poorer developing countries have a major share of the trade is in the supply of construction labour. Various strategies have been suggested to correct this imbalance in the distribution of international construction resources, many of which are essentially autarchic.

Nevertheless, there are also arguments for encouraging the poorer developing countries to make use of this international construction system to facilitate their production of modern infrastructures and their creation of appropriate and efficient domestic construction capacities. The pull and push factors established the Offsite (IBS) method to be developed in response to the external factors and considerations from year 1850 to years of 2005. The lists of factors such as sporadic urgent demand, industrial revolution, changing fashion, other sectors advances, increased labour costs, decreased in skilled labour, changing the client expectation, IT and digitals controls and safety and health issues impacted the IBS development (Gibb, 1999).

2.4.2 Nature of Industry Development

As time goes by the nature of the industries has evolved from manually used labour only in primitive time to developing society with introduction of agricultural and mining activities. It is a requirement for labour, land and capital in those eras. However within the industrialisation society, the manufacturing process and utility services must be equipped by involvement of entrepreneur and information on top of labour, land and capital. Currently the world scenarios go through the developed and post industrial society, the research and development (R&D) shall come together with technology and knowledge. New technology and modern innovation techniques in construction method will drive the popularity of IBS.

2.4.3 Perception of Current Conventional Construction Industry

Construction Industry is perceived as dirty, dangerous and delays (3D). It is also viewed as under performing. To overcome the lack of innovation in conventional system and site production management, the introduction of industrialised building system (IBS) shall be considered. In Malaysia, it would not attract the local workers to be involved. The foreign workers from lower economic countries would take to the labour markets.

2.4.4 Construction Stake holder Readiness

Construction industry stakeholders mainly include many parties such as clients, owners, developers, consultants, contractors and suppliers. The successful implementation of IBS will obviously depend on the stakeholder readiness and respond. The cooperation and smart partnership to make the project perform in better manner are thoroughly required from the players. The survey conducted by CIDB in 2003 shows the usage level of IBS in local construction industry as only 15 percent (CIDB,b, 2003).

2.4.5 Others Issues of Implementation

CIDB Malaysia outlines the twenty main issues that contributed to the factors of implementation of IBS in Malaysia (Hamid et al., 2008). It is related to the various parties of stakeholders in construction industry. There are still on the perception issues by design consultants toward IBS which might be due to lack of knowledge among them. The promotion and education can be highlighted to change the mindset. The priority and situation faced by stakeholders similar to chicken and egg dilemma. Materials to produce the components of IBS are not to the expected which may brought forward the problems of implementation. The roles and responsibility for adopting the concept of IBS from government and agencies, education body, research institute and construction stakeholders must be put in place. The R&D to support the IBS components such as materials, special equipment and machineries, skilled and educated workers must be carried out. Design consideration of IBS building for energy conservation and sustainable construction also must be put in attention.

2.5 Economic and Financial Issues Affected IBS in Malaysia

In Malaysia, construction industry constitutes important elements of Malaysian economy. A major role from the construction industry in Malaysia has contributed significantly to the economic growth in Malaysia (Hamid et al., 2008; Othman et al., 2006). The construction industry contributed between 3 percent to 5 percent of the National Gross Domestic Product (GDP). IBS in Malaysia has begun in early 1960's

when the Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program (Thanoon et al.,, 2003).

In 1980s when the Malaysian economic stated the growth of construction industry at an average of 13% , Selangor State Development Corporation (PKNS) acquired precast concrete technology from Praton Haus International based on Germany to build low cost walk up flats and high cost bungalow in Selangor, Malaysia (CIDB.b, 2003). In 1984, the usage of steel structure as once of IBS has gained attention in constructing the 36 storey of Dayabumi office complex by Takenaka Corporation of Japan (CIDB.a, 2003).

It is reported that 680,000 units of houses as targeted to be constructed in the Seventh Malaysia Plan (1996-2000) with the majority of low and medium low cost houses. But conversely, the achievement are disappointing with only 20% completed are reported (Trikha, 1998). It had been unsatisfactory and very slow due to global and Malaysia economic crisis (1998-1999). The shortages of skilled labour and materials have been identified as the major reason of malfunction in the performance.

In 2003 and 2004, CIDB and Department of Immigration Malaysia had recorded that foreign workers involved in construction industry in Malaysia are 2.1 million with hundreds of thousand workers identified as illegal workers. The Malaysian economic has attracted a huge number of foreign workers to be employed. According to a report from Department of Immigration Malaysia, foreign workers represent comparative moderate percentage of 44 percent of total workforce in construction industry. In order to change the characteristics of construction industry from labour intensive to knowledge worker, the implementation of IBS should be actively geared up to decrease the labour forces. The economic condition in 2003 and 2005 has boosted the construction industry with contribution to GDP from 3.2% to 2.9% when Malaysian GDP growth at highest 7.2% showed the infrastructure and facility development. Pre cast steel frame and other IBS are used in the hybrid construction to build national landmark such as Bukit Jalil Sport Complex, Lightweight Railways Train (LRT) and Petronas Twin Tower. It was reported that 21 numbers of manufactures and suppliers of IBS have actively promoted the IBS in Malaysian construction industry (Thanoon et al., 2003).

In 2003, a survey conducted by CIDB on the IBS implementation status has revealed the usage level of IBS in local construction industry stands at only 15% (CIDB,2003). The growth of these IBS are attributed to the need of huge demand of housing industry during the Eighth Malaysian Plan (2001-2005) whereby 600,000 to 800,000 houses are expected to be built. The conventional building system has not been believed to cope with the demand (Kadir et al.,, 2005). A solution to propose the IBS will help to set housing programs under 8th Malaysian Plan to overcome the shortage demand.

Although the construction industry stated 2.7% of the gross domestic product (GDP) in 2006, the industry is critical to national wealth creation and acts as catalyst and regulator to other economic activities. The introduction and use of IBS taken place has immense inherent advantages as well as benefits as discussed in terms of productivity,

quality and cost. As indicator to that economy development until 2007, there are 895 companies registered as IBS contractors and 138 manufacturers of IBS components.

3 Research Methodology

This research paper is based primarily on a literature review of industrialised building system development and issues in Malaysia. The main idea is to present the scenario of IBS implementation issues in term of benefits and contribution factors that affected it popularity. This preliminary study will set up initial conceptual framework of PhD research to further explore the most significance issues. Since the research is still in beginning stage of literature review of IBS, it is yet to determine the critical success factors or implementation framework.

However, from the literature review carried out from 1980s to date, the possibilities factors of implementing the IBS in Malaysian construction industry are discussed on several themes. The issues of strategies, rules and regulations, policy, design, modular coordination, training issues, knowledge and competencies may be discussed. The technical and human issues to justify the success factors may be attributed from the site layout, project planning methods, planning software, team works among the organisation on or off site, the leadership practice by project manager also may influenced the significant contribution. The other internal and external factors that should not be ignored in term of IBS implementation shall be stated as procurement strategies, conditions of contracts, globalisation issues, information technology (IT) and communication technology. The supply chain management and partnering approaches toward successful IBS project implementation shall be considered as well.

The study will be conducted through the quantitative method of research. The questionnaires will be designed to seek the perception from the IBS project stakeholders. An analysis will help to justify the aims and objectives expected. Verification will be carried out with expertise in the area through semi structured interviews. The long term aim of the PhD research is to develop appropriate model for IBS implementation on justified phases of construction.

4 Conclusion and Further Research

In this age of global construction scenario, when the issues of cost saving, time speeding, better quality building performances and safety and health utmost importance, the appropriate IBS and method used are required. However the comparison study shows inconsistency results of each benefit and should be further explored to identify the actual strengths and weaknesses of IBS. The most optimum benefits will be gained when suitable building system has been selected. The construction industry must encourage and promote the usage of IBS for increased productivity, speedier construction time, and improved quality at a competitive cost.

The changes and evolution of traditional or conventional method to industrialised building system shall be involved among all of the stakeholders in construction industry. This would require the closed and smart collaboration between builders and researchers. The system originated from other countries should not totally be adopted to

be implemented in local country. Malaysia needs to adapt and align the targeted construction road map to remain competitive in the global construction industry when the issues and challenges of skilled workers, productivity, time, cost and building quality has been left behind. Malaysian contractors and construction players must change the mind set and accept the fact to adapt the current trends for global survival.

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Factors Effecting SME's Performance: Literature Review

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Abstract:
Small and Medium Enterprises (SMEs) make substantial contributions to national economies and are estimated to account for 80% of global economic growth. Thriving economies in countries such as the US, Britain, Europe, Japan, etc., are vastly dependent on their well regulated, established, organised and monitored SMEs. In the UK, the Department of Trade and Industry (DTI) in 2004 estimated that of the 4.3 million business enterprises, 99.9% were small to medium sized (SMEs). At the start of 2004, SMEs accounted for more than half (58%) of all UK employment (small enterprises accounting for 46.8%; medium-sized enterprises accounting for 11.7%); and more than half (51.3%) of the UK's estimated business turnover of £2,400billion (small enterprises accounting for 37%; medium-sized enterprises accounting for 14.3%). The aim of this paper is to examine the role of SMEs in building up the housing industry in developing countries. Factors at the strategic level will be investigated and their impact on the SMEs performance will be assessed. These factors are the role of government, governing bodies, finance, training, entrepreneurship, e-Information, etc. will negotiate all possible factors related to SMEs and attempt to draw a model to explain the relations between these factors. The outcome of this research paper will be based entirely on literature review.

Keywords:
SMEs, SMEs Performance.

1 Introduction

There is a universal recognition that SMEs are crucial facilitators of economic growth, (Soontiëns, W. 2002). Therefore, SMEs are considered to play a major role not only in construction but in the entire economy. Moreover, thriving economies in countries such as the US, Britain, Europe, Japan, and etc., are vastly dependent on their well regulated, established, organised and monitored SMEs (Networks and Supply Chains). In the UK, the Department of Trade and Industry (DTI) in 2004 estimated that of the 4.3 million business enterprises, 99.9% were small to medium sized (SMEs). At the start of 2004, SMEs accounted for the following (*Statistical Press Release URN 05/92*, Office for National Statistics, 2005):

- More than half (58%) of all UK employment (small enterprises accounting for 46.8%; medium-sized enterprises accounting for 11.7%);

- More than half (51.3%) of the UK's estimated business turnover of £2,400billion (small enterprises accounting for 37%; medium-sized enterprises accounting for 14.3%).

Construction and Housing industry in particular, needs effective systems of SMEs networks and supply chains to advance and meet its targets. Thus, in order to set up realistic and feasible strategies; strategy makers need as much as possible accurate data and information on their supply chains.

The aim of this paper is to examine the role of SMEs in building up the housing industry in developing countries. Factors at the strategic level will be investigated and their impact on the SMEs performance will be assessed. These factors are the role of government, governing bodies, finance, training, entrepreneurship, e-Information, etc. Most published journals, articles, papers, etc. have mainly investigated a few factors at a time. This paper will discuss all possible factors related to SMEs and attempt to draw a model to explain the relations between these factors and SMEs performance.

The result of this research paper is based entirely on literature review. The paper first identifies the group of possible factors that are related and affect SMEs, second, groups all factors together, and finally produces a model (diagram) illustrating these factors and their relationships and impact on SMEs.

2 Literature Review

SME is an abbreviation for Small or Medium Enterprise. SMEs are generally described as those that employ less than 250 staff and have a turnover of less than £25M (Institute of Quality Assurance, 2008). More accurately, The Department for Business, Enterprise and Regulatory Reform (BERR, 2008) uses the following definitions:

Table 1: Numbers of SMEs Employees Guidance (BERR, 2008)

Type of Firm	Number of Employees
Micro Firm:	0-9 employees;
Small Firm(includes micro)	0-49 employees
Medium Firm:	50-249 employees;
Large Firm	Over 250 employees.

The European Commission (EC, 6 May 2003) revised its definition of an SME as micro, small and medium-sized enterprises and are socially and economically important, since they represent 99 % of all enterprises in the EU and provide around 65 million jobs and contribute to entrepreneurship and innovation. National legislation tries to readdress this issue by granting various advantages to SMEs. A legally secure and user-friendly definition is necessary in order to avoid distortions in the Single Market.

Table 2: European Numbers of SMEs Employees Guidance (EC, 2003)

Enterprise Category	Headcount	Turnover	or	Balance Sheet Total
medium-sized	< 250	≤ € 50 million		≤ € 43 million
small	< 50	≤ € 10 million		≤ € 10 million
micro	< 10	≤ € 2 million		≤ € 2 million

3 SMEs Strategies

Small and Medium Enterprises (SMEs) make substantial contributions to national economies (Jutla *et al.*, 2002; Poon and Swatman, 1999) and are estimated to account for 80% of global economic growth (Jutla *et al.*, 2002). Thus, SMEs is the nerve of all economies and considered as an indicator to a success or failure of performance. Because of SMEs' vital role in the global economy, it is important to protect this contributor and bring it to the highest level by setting sound strategies and policies. Burke *et al* (2004) argue that the definition of strategy in SMEs is often perceived as person centred rather than process driven. The performance (in many cases the survival) of small firms can be synonymous with the success of the leadership style of the entrepreneur. Thus, SMEs strategies are usually set by a person who is most of the time the leader or the owner of the business. Strategy relations are explained in the figure below:

Figure 1: Elements of Strategy (Burke *et al*, 2004: 126-138)

According to the above Figure 1; the elements that should be considered when setting SMEs strategy are the resources available, market situation, competition status, nature of activities and environmental issues. Like all businesses, SMEs are driven by profit. Setting successful strategies and policies are important and get it right from the first time. The stance of SMEs is fragile and there is no margin of error. Unfortunately, the majority of SMEs are run by Owners/Managers which most of the time have not enough education or training. Therefore, strategy setting for SMEs meant to be very basic and not sophisticated as long as it leads to survival only.

4 SMEs Growth Cycle

SMEs vary widely in size and capacity for growth. They are characterised by independence of action, differing organisational structures, and varied management styles. Yet on closer scrutiny, it becomes apparent that they experience common problems arising at similar stages in their development (Churchill and Lewis, 1983).

Churchill and Lewis (1983) add that there are five stages of growth for SMEs. These five stages as follows:

Stage I: Existence

The main feature of this stage is that the organization is a simple one; therefore, the owner does everything and directly supervises subordinates, who should be of at least average competence. (Churchill and Lewis, 1983).

This stage concerns with the following issues:

Can we get enough customers, deliver our products, and provide services well enough to become a viable business?

Can we expand from that one key customer or pilot production process to a much broader sales base?

Do we have enough money to cover the considerable cash demands of this start-up phase?

Stage II: Survival

In reaching this stage, the business has demonstrated that it is a workable business entity. It has enough customers and satisfies them sufficiently with its products or services to keep them. (Churchill and Lewis, 1983).

Stage III: Success

The decision facing owners at this stage is whether to exploit the company's accomplishments and expand or keep the company stable and profitable, providing a base for alternative owner activities. (Churchill and Lewis, 1983).

Stage IV: Take-off

In this stage the key problems are how to grow rapidly and how to finance that growth. (Churchill and Lewis, 1983).

Stage V: Resource Maturity

The greatest concerns of a company entering this stage are, first, to consolidate and control the financial gains brought on by rapid growth and, second, to retain the advantages of small size, including flexibility of response and the entrepreneurial spirit. (Churchill and Lewis, 1983).

The above five stages can be illustrated in Figure 2 below :

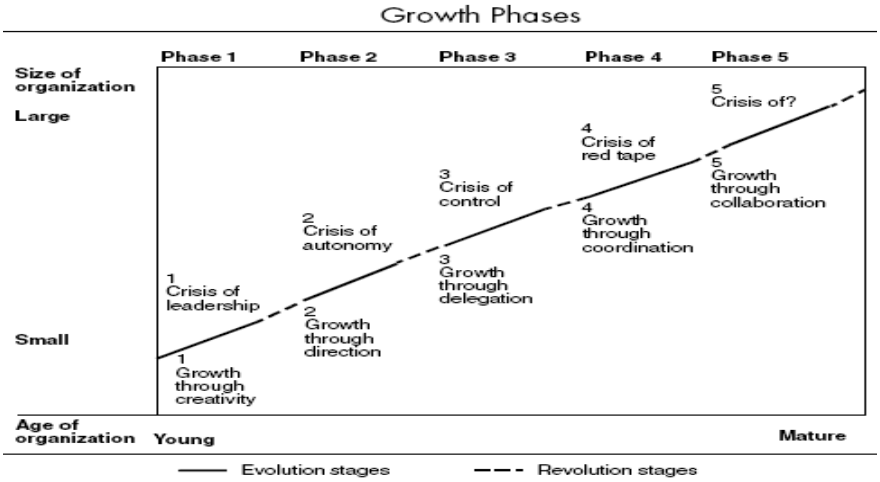

Figure 2: Growth Five Phases (Churchill and Lewis, 1983)

It appears that SMEs have to go through all the Five Stages from their existence to achieving major success. Some SMEs opt to a partial success and have not to go through all the stages. In other words, the road to major growth, expansion and success; SMEs have to go all five stages where as for a partial or non-expansion and success; SMEs have to pass one or couple of stages. In the event of no progress; SMEs has to stand still and remain where they are.

Moreover, Phase One depends entirely on the owner/manager in making decision regarding creativity on all activities and processes .i.e. the owner/manager is only the creative person. Phase Two is defining direction of growth and setting parameters. It is defining the path for advancing forward. Phase Three requires an owner/manager searching for new financial sources and new markets by delectating and visiting banks, lenders, expected new customers and etc. Phase Four is coordinating activities within SMEs and perhaps increase the size by adding and including more department, products and services. Finally, Phase Five; is the step where merging and collaborating with other SMEs takes a place in order to strengthening the status of all parties in local and global market.

5 Factors Affecting SMEs

This Section 5 is dedicated entirely on SMEs strategic factors that can impact the performance of SME's. These factors such as the role of government, governing bodies, finance, training, entrepreneurship, e-Information, etc. and are investigated separately in literature and are brought together in one holistic model (Section 7) to display their effectiveness on SMEs.

5.1 Government Role

Ruth *et al* (2006) argue that regulating is the process aims to protect, organise, facilitate, monitor, support, etc. the performance of SMEs. This process will also encourage the creation of new SMEs to the local market which in return will benefit communities,

local economies and the country as a whole. It will also strengthen situation and performance of existing SMEs and therefore their contribution to communities they operate in and the national economy. According to Ruth *et al* (2006); the British Government has felt the necessity and taken different approach toward legislating, regulating and law enforcement of SMEs. The recent Government thinking around the introduction, implementation and enforcement of new legislation pays tribute to the need for flexibility. SMEs contribute and play great role in the British economy; unfortunately; it is the least regulated SMEs sector in Europe.

5.2 Governing Body and Task Force

Because SMEs is the least regulated in Europe, the British Labour Government decided to intervene and step-in to regulating SMEs. Ruth et al (2006) state that the British Government has set a new body called Better Regulations Task Force (BRTF). The BRTF responsibilities are the principles of proportionality, accountability, consistency, transparency and targeting, intended, in the medium to long-term, to try and reduce administrative burdens and to ensure outdated regulations are phased out in a timely manner. Thus, the British approach in the creation and introduction of Better Regulations Task Force (BRTF) seems an effective way of reducing administrative cost, keep legislations and regulations up-to-date, and monitor governmental regulations and legislations in med-long terms. A country from the developing world may benefit significantly from the British approach and the creation and introduction of Better Regulations Task Force (BRTF); however; it is important to learn how this governing body (BRTF) established, operates, capacity and power, funded, etc.

5.3 Financing SMEs

Hussain, J. *et al* (2008), claim that in 1984, the People's Bank of China became the central bank and introduced a number of reforms and mechanisms to help and support SMEs. In the beginning of 1999, the Chinese Ministry of Finance in collaboration with other government departments started to actively promote a SMEs loan guarantee system. By 2001, a series of laws and regulations had been introduced, including the Provisional Regulation of SME Credit Guarantee System and the Management Methods of Credit Guarantees for SMEs. The SME credit-guarantee system, established more than 200 credit-guarantee institutions, raised a guarantee fund of 10 billion Yuan ($1.4bn), and contributed to the expansion and improvement of the credit environment for SME development. The Ministry of Science and Technology provided 10 billion Yuan ($1.4bn) per annum to build venture capital funds for high-tech enterprises. It is clear that in recent years, China has begun placing an emphasis on supporting SME development. Government, ministries and private bodies all have to participate to improving and supporting SMEs.

5.4 Outreach SMEs / Skills and Recruitments Shortage

Vinten (1998) suggests that there are recruiting criteria SMEs has to consider as follows:

Technical staff, is the skills they possess in order to do the job;

Secretarial staff, is the experience of doing the type of work;

"Inputers", is the ability to type - experience of this type of work could not have been gained in other work experience - the company provides further training.

Thus, SMEs do not require wide range of staff/labour. A member of staff could do one or more tasks. SMEs managers tend to keep the number of staff to minimal to minimise cost and increase profit. Moreover, they are not prepared to send any employee to training because this will cost them more money and time.

5.5 Training

Johnston and Loader (2003) claim that evidence suggests that a range of influences mean that employees of SMEs are less likely to take part in training than those working in large organisations. A report published by the Department for Education and Employment (DfEE, 2000) determines that there is an increasing provision of training, as businesses get bigger in size, and that this is true for off-the job and on-the-job training. The challenge for training providers is to design an offering, which encourages SME participation within a context of these influencing factors.

An empirical research conducted by Westhead and Storey (1997) discovers that employers/owners of SMEs show their ignorance to what they view as formalised learning, which they associate with school. The market forces explanation argues small firms are less likely to provide training for their employees, due to a variety of supply and demand factors such as a concern with short-term survival issues, when training benefits are often long term; the probability of employee poaching; absence of internal labour markets; and, for managers, promotion less likely. Thus, it is clear that SMEs or perhaps Micro firms are not interested in training their employees. There are several reasons such as the cost of training which might increase the bills and therefore dramatically reduce profits. Moreover, the time training consumes and force employees out of their workplace where they are desperately needed. SMEs employers are frightened to lose employees after training them and gaining skills to better paid jobs, and etc.

Finally, it would be more beneficial if a government play more affective role by producing guidelines, support, lectures and education to owners of SMEs in terms of legislations and regulations, training for management and employees, planning and policies, expansion, and etc. SMEs should also be encouraged to explore new potential local and global market and not to content on what they have. It is not easy to deliver this message; however, genuine attempts have to be made in order to keep SMEs alive because of their massive contribution to economies worldwide.

5.6 Politics

There are two separate political issues related to SMEs. The first is SMEs exist and operate in slums and shanty towns in the developing countries, and the second is Code-of-Practice in the developed countries. Firstly, SMEs in deprived areas are major players and contributors to overall performance of economies and have been targeted by politicians worldwide. These SMEs contribute billions of dollars every year to their economies, (China Daily 2006, Economist 2007, and UN-Habitat-Brazil 2003). This means that governments in developing countries have realised the significant rule of legible electors in slums and how slums' issues and their inhabitancies become so

important only during election periods. Therefore, governments such as China, India, Brazil, and etc., have decided to improve living conditions in slums and therefore invest billions of dollars to providing electricity, fresh water, sewage, telephone and internet services and etc. The massive number of electors in slums and shanty town host and incubate massive number of SMEs in industries such as leather, textile, construction, etc.

Secondly, Wagner B., *et al* (2005) claim that the Code-of-Practice would include provision for dealing with non-cost related payments required or requested of suppliers, access to shelf space, the imposition of charges and changes to contractual arrangements. However, the Office of Fair Trading revealed that suppliers to the UK's leading supermarkets believe that the code of practice designed to give them a stronger voice has failed to achieve its aims. In the UK the code of practice is voluntary, whereas French supermarkets are legally obligated to dedicate ten per cent of their shelf space to local suppliers. In other words, the UK lags behind their European counterparts. The Code of Practice is totally voluntarily and this means there is no obligation on mega firms to support and deal with British SMEs. On the contrary, the French government have introduced their Code of Practice which forces mega firm dealing with at least 10% out of their business with French SMEs. It is important and more beneficial if government in developing countries; like the French Code-of-Practice, to intervene and produce a similar code of practice to help and support local SMEs and guarantee a stabilised and sustainable future.

5.7 Free Market and Fair Competition

Karaev A. *et al* (2007) state that market conditions is a crucial factor; among others that dictate the survival of SMEs. SMEs in economies run by capitalism are thriving and doing better than others in semi-capitalism and socialism. Thus, free market and competition result in higher quality products and services, reasonable pricing and customer satisfaction. In other words, if there is a fair competition; then suppliers (SMEs) will receive fair and desirable deals and in return provide and deliver higher quality products and services. However, Karaev *et al* (2007) believe that there are signs of market dominations by Mega and Giga Enterprises (MGEs) in capitalist economies. This is a global notion and governments are doing very little to help SMEs. The reason is that MGEs are closely related to top government individuals and departments. Moreover, MGEs have the lion share in all markets which force government not to upset them. Politics might step in and politicians may use these critical issues for their purposes. In France; SMEs have 10% of the market share of MGEs. This is a step forward; however, it is too little and the market has to be redesigned.

5.8 Entrepreneurs/Owners

According to (Timmons, J. A. (1990), Stevenson H. H. (1991), Kao, R. W. Y. (1995), Legge and Hindle (1997), an entrepreneurial business is one that engages in one or more of the following categories of behaviour;

Introduction of new goods or services,

Introduction of new methods of production, or usage of new sources of materials or components,

Opening of new markets,

Establishment of a new industry structure or exploitation of a new style of regulatory environment that is, the principal goals of an entrepreneurial business are profitability and growth and the business is characterised by innovative strategic practices.

Clearly, Entrepreneurship is about innovation and implementing new ideas in new environment and circumstances. It is the process of continuous searching for new opportunities to move forward to new and unexplored marking areas. Moreover, Entrepreneurship is the stage of changing the role of employees in order to become more competitive and sustain higher level of success. New, old and established enterprises are all in need for Entrepreneurship to expand in new territories. Finally, Entrepreneurship is an aggressive approach by the entrepreneur in decision making for changing business environment and circumstances to be different against a background of common events.

5.9 e-Information Sources (IT)

Kacker S. (2008) claims that information plays a vital role in the success of any business. Recognising the importance of e-Information some important services could be obtained from the following:

- E-transaction
- Supply databases
- Advisory and Infomediary Services
- Market intelligence
- Technology providers
- Information providers
- Linkages with relevant institutions

This means that in order to improve SMEs performance; there is a desperate need to improve electronic services and their providers systems. SMEs need vital information to survive, improve, develop and to be competitive in the local and global market. SMEs by using e-Information will also be able to obtain information on financial support and institutions, new technologies and innovations, labour agencies and market status and etc. The Internet and e-Commerce is also important and SMEs should include them in their system. SMEs are knowledge based and their success and survival depend on skills, creativity, innovation, discovery and inventiveness. The introduction of PC and Internet influences the rate of changes and accelerating rapidly, as new knowledge idea generation and global diffusion are increasing. Creativity and innovation have a bigger role in this change process for survival. It appears that Indian SMEs have continued on their path of progress.

5.10 Standardisation/ISO 2000

The Institute of Quality Assurance (IQA, 2008) states that ISO 9001:2000 is the latest version of a quality management standard which has been in existence for many years and which has been applied by more than 300,000 organisations world-wide. It specifies

minimum requirements for a quality management system where an organisation needs to (IQA, 2008):

1. Advantages of ISO 9001:2000 Certification

IQA (2008) suggests that there a number of advantages for SMEs if they choose to register for ISO 2000 certification and the advantages are as follows:

Improvement in "bottom line" profit through:

- Better efficiency
- Continual improvement
- Less waste
- Consistent control of key processes
- Possible reduction in insurance premiums
- Promotion and standardisation of good working practices
- Greater marketing appeal and improved public relations
- Meeting the requirements for inclusion on some tender lists.
- Provision of a vehicle for training new employees
- The effective management of risk
- Provision of a vehicle for introducing a culture for opportunity
- Increasing the potential for world-wide recognition

2. Disadvantages of ISO 9001:2000 Certification

IQA (2008) claims that there a number of disadvantages if SMEs join ISO 2000 certification. These disadvantages as follows:

- Costly to obtain and maintain
- Lengthy time-scale to obtain certification
- Time-consuming development
- Difficult to implement
- Organisational resistance to change
- Staff resistance to change
- Hard to maintain enthusiasm for the system
- More documentation

Thus, if SMEs could manage the cost and period of ISO 2000 registration, then SMEs could survive in the long run. ISO 2000 is an indication of quality management and will improve performance of SMEs. The majority of failures of SMEs are caused by the lack of training of owner/manager, finance and accounting. In other words, it is clear that that ISO 2000 will force SMEs to employ better qualified managers and accountants to run their business. This process might be costly and consuming time, however, it will benefit SMEs and their customer. Moreover, ISO 9001 will organise more the internal and external processes and activities of SMEs. ISO 9001 will also bring new dimensions to SMEs in terms of responsibilities, resources, improvement, measurement,

analysis, monitoring, changing and etc. These dimensions will ease the pressure on the owner/manager and employees and make them more productive.

6 SMEs Relations Diagram

Upon all the above discussions, the relations between SMEs and the related factors are highly sensitive. The factors identified such as Government Role, Governing Bodies and Taskforce, Finance and Banking, Training and Education, Entrepreneurship and Innovation, Outreach, Quality Management System, Politics, e-Information and Data, Mega Enterprises Involvements. These factors could be illustrated in the following Figure 3:

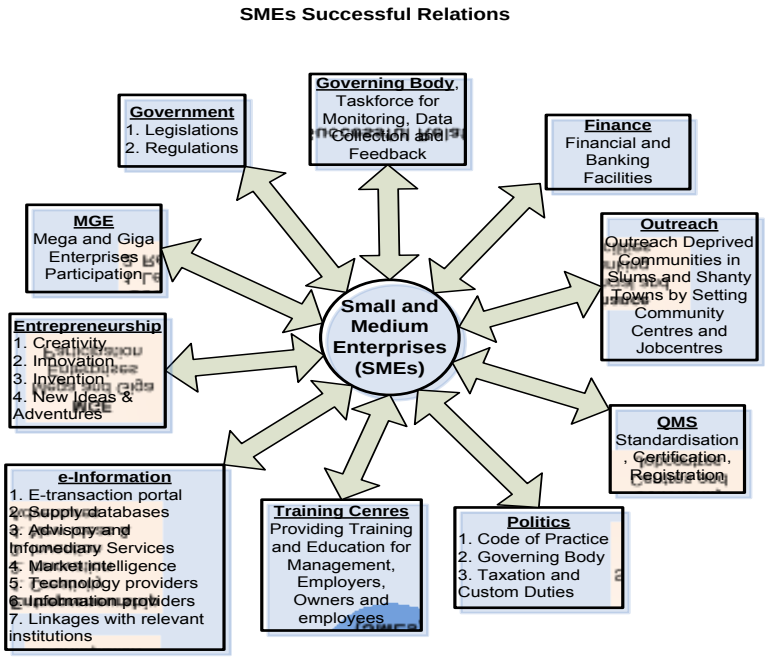

Figure 3: Factors Affecting SMEs

Figure 3 illustrates the factors that directly affect the existence, survival, development and improvement of SMEs. Any network, supply chains and SMEs; whether they are well established or not; they need to consider all factors illustrated in the Figure 3. In other words; a newly-established or even perhaps well-established SMEs; both need to consider the 10 factors in Figure 3 in order to survive, develop and expand their business locally and internationally. If for example; a country like Iraq needs to build up functional, successful and effective network systems, supply chains and SMEs, then the Iraqi Government and industries, in general, require considering the 10 factors illustrated above. These 10 factors have proven in previous discussions that they are directly affecting SMEs in developing and developed countries. Finally, SMEs contribute significantly to the growth of economies worldwide, therefore, housing industry strategies implementation and success depends significantly on the performance of the industry's SMEs. If a failure occurs in SMEs performance, then it will be transferred to the performance of the housing industry and to the entire economy.

7 Conclusion

The outcome of this research is that SMEs need significant effort in order to establish, survive, thrive, develop and contribute as a successful industry in the economy. There are 10 factors have been identified each of which can play an important role and affect the performance of SMEs. These identified factors are such as the Government role and influence in regulating and legislating SMEs, setting up a governing body and task force to make sure these regulation and legislation are put into practice, providing adequate training for all staff of SMEs including managers, setting up an effective financial systems and institutions which could help in providing all necessary services and products to SMEs, provide assistance and fair competition between SMEs and Mega stores, the role of the entrepreneur/owner in driving forward and making decision, the availability of adequate e-Information systems and skilled workers, political factors could play an important role in terms of setting Code-of-Practice and Taxation system, encourage SMEs to register for ISO 2000 because it will improve their image and also bring their performance and quality to a higher level, and finally, outreaching SMEs and the labour force in deprived area and slums because these are rich source for employment, employment and growth.

This research, so far, has identified 10 important factors that affect SMEs' performance, survival, improvement, advance growth, etc. The research has presented a new holistic model illustrates the relationships between SMEs and these factors. This does not mean there are no other factors exist. Therefore, in order to identify other factors (other than the 10 factors have been identified in this research) more research is needed to explore this particular area. A researcher in different research and circumstances may discover other factors which are also important and affect the performance of SMEs.

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Modeling IT Business Value for Construction Industry: A Conceptual Approach

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Abstract:
The idea that information technology (IT) resources can be used by organisations to gain competitive advantage has been around for over two decades. However, most of the concepts related to competitive advantages of IT are imprecise, unstructured and are not directly applicable to the construction industry. Furthermore, a major part of the literature in the area continues to be anecdotal and primarily descriptive. There is little evidence of an accepted theoretical framework for applying the ideas and there is even less in the way of empirical evidence concerning the validity and utility of these concepts. This paper presents the first phase of a three-stage research process of developing and empirically testing a comprehensive integrated IT business value model that investigates the relationship between IT-enabled strategies and construction organisations' competitive advantage. The model uses hybrid theories of Porter's generic strategy of value-chain analysis and organisation resource-based view and core competence in the construction industry. Since construction is a project-oriented industry, the performance measure is conceptualized by the model at project level using the organisation's value chain and aggregated to organisation level. A validated conceptual model will be tested empirically using Data Envelopment Analysis of sampled data from a survey questionnaire of construction organisations.

Keywords:
Competitive Advantage, Construction Organisation, Performance Measure, Information Technology (IT) Business Value, Strategic Management

1 Introduction

The strategic impacts of Information Technology (IT) on the organisations' performance have been of interest to both managers and researchers for decades (Davis et al., 2003). Studies in the field have led to the suggestion that IT-enabled strategies could be used to gain competitive advantage. The argument is that IT resources do offer strategic advantage to organisations through efficient and cost effective delivery of the organisation's value chain.

However, most of these studies were carried out through imprecise and unstructured theoretical constructs that seem to lead to equivocal results (Porter and Millar, 1985; Mahmood and Soon, 1991; Lee, 2001). Furthermore, there is a dearth of empirically validated frameworks used in most of the studies (King et al., 1989). Attempts to explain the inconsistencies in the various studies on the impact of IT on organisation performance ascribe difficulties associated with modelling and measurements of the return of IT investment, mode of data collection and sampling, industry type, and choice of dependent variables as some of the major reasons (Brynjolfsson, 1993; Kohli and Devaraj, 2003; Oh and Pinsonneault, 2007).

IT-enable strategy has been suggested to have a significant impact on construction organisations competitiveness. These impacts include improvement in overall construction processes thereby creating new construction business opportunities (Skibniewski and Abduh, 2000). Also using IT in construction projects are found to enhance collaboration by supporting communication among project members and sharing information and documents; IT provides a web-enabled project management to support e-commerce (Skibniewski and Nitithamyong, 2004).

To investigate the impact of IT on the competitiveness of construction organisations, this study adopts the two dominant theories of Porter (1985) models of generic strategies and organisation resources based-view of competitive advantage (CA) as its theoretical framework. The use of Porter's model to evaluate construction organisations' competitiveness is supported by the model's popularity, well-defined structure, feasibility, clarity, simplicity, generality, and its complementarities to RBV (Ormanidhi and Stringa, 2008). While on the other hand, RBV combine the rational of economics of the Porter's industrial organisation theory with management perspective.

The paper presents only the first phase of the three-stage research process of deriving and empirically testing a comprehensive integrated IT business value model to investigate the relationship between IT-enabled strategies and construction organisations' performance leading to gaining competitive advantage.

1.1 Objectives and Scope

Despite a multitude of studies on IT business value and the concept of an organisation's competitive advantage using IT-enabled strategies; there is no known model measuring the IT business value in literature addressing the unique nature of the construction industry. Most concepts of CA in strategic management are derived with particular reference to manufacturing industries and few applied to services industry such as banks and retails. Therefore the overall aim of this research is to fill this vacuum and

contribute to literature on evaluation of IT investment in the construction industry and construction management. The objective of this phase of the research is to develop a comprehensive conceptual model that can be used to investigate and measure the impact of IT-enabled strategies on the performance of construction organisations in order to gain competitive advantage. Data Envelopment Analysis (DEA) will be used to benchmark and establish the relative competitive advantages of the construction organisations within strategic groupings of the industry. The empirical result will be used to benchmark the construction organisations IT-induced performance.

The rest of the paper is structured into literature review in section 2, the research questions and hypothesis in section 3; research methodology in section 4, description of the model in section 5; finally, section 6 concludes and direction for further work

2 IT-enabled Competitive Strategies of Construction Organisations

2.1 Concepts of Competitive Advantage

Competitiveness is an elusive and multidimensional concept with no universally accepted definition. Thus, there is plethora of theories explaining how organisations could achieve competitive advantage. The two dominant concepts in the strategic management literature used in deriving the IT business value model for the construction industry are the Porter's (1980, 1985) competitive strategy models and the resource-based view (RBV) and core competence theory (Barney, 1991). The hybrid use of the two concepts in this study aims at proving a complementary effect of each of the concepts against the limitation of the other.

2.1.1 Porter's Theory

Porter's theory for organisation's competitiveness takes an industrial organisation view of competitive advantage; it was grounded on the earlier works of Mason (1939) and Bain (1959) in the area of industrial organization economics. Major components in Porter's theory are (1) the five competitive forces model; (2) the three generic competitive strategies; and (3) the value chain. Porter's definition of competitive advantage seems to implicitly equate competitive advantage to performance, and sustainable advantage to sustainable profitability (Ma, 2000).

Figure 1

The main limitations of Porter's model is its lack of clarity in addressing the internal mechanisms by which an organisation converts the influence of a challenging external environment into useful internal abilities and it does not seem to satisfy the requirements for a solid theoretical framework (Murry, 1988). For construction

organisations it was found that the simultaneous pursuit of more than one generic strategy is viable (Yahuza, 2006).

Porter (1985) argues that to identify potentials for competitive advantage it is necessary to look at the individual parts of the whole organisation using its value chain. He suggested that differences between value-chains are a key source of competitive advantage. An organisation's value chain is a system of interdependent activities, which are connected by linkages, as shown in Figure 1

2.1.2 The Resource-based View (RBV)

The RBV shifts the focus from the industry structure to the resources developed by an organisation. The resource based view of the organisation is based on two underlying assertions, (1) that the resources and capabilities possessed by competing organisations are heterogeneous; and (2) that these differences may be long lasting (Barney, 1991). However, the concept of resources remains an amorphous one that is rarely operationally defined and tested in different competitive environments.

A major contribution of the RBV is that it provides valuable suggestions for an organisation to focus on its specific internal resources. Therefore, it largely complements the limitations that are inherent in Porter's theory (Flanagan et al., 2007).

2.2 The Contribution of IT on Organisational Performance

As pointed earlier, it has been argued that competitive advantage can be attributed to certain IT resources and other organisation's complimentary capabilities of an organisation which are difficult to imitate. Therefore, when an IT-enabled strategy is implemented in the presence of heterogeneous organisation capabilities, such organisation will be able to gain a sustained competitive advantage (Porter, 1980; Mata et al., 1995).

There are several studies suggesting that organisations were able to improve their market share and profitability through innovative use of IT. The studies both theoretical and empirical provide evidences indicating that organisations implementing IT-enabled strategy are able to improve their performance and gain competitive advantage over their direct competitors (Porter and Millar, 1995; Dehning and Stratopoulos, 2003).

The following are definitions of IT and classification the IT resources as used in this paper

2.2.1 Information Technology Resource

Information Technology is variously referred to as a collective integration of computing technology and information processing; as something which include equipment, applications and services that are used by organisations to deliver data, information, and knowledge to individuals and processes (Mentor, 1997; Turk, 2000).

Resources here are viewed as the assets and capabilities organisations utilise to develop and implement a given strategy, they could be tangible or intangible. Therefore IT resources are those tangible and intangible organisation's assets that are related to the

implementation of IT-enable strategy and include IT infrastructure, IT managerial skills, and IT technical skills (Piccoli and Ives, 2005).

IT-dependent strategic initiatives consist of identifiable competitive moves that depend on the use of IT to be enacted and are designed to lead to sustained improvements in an organisation's competitive position (Ross et al. 1996).

While technology is a core component of IT-dependent strategic initiatives enabling the system of value-adding activities, its successful implementation requires a number of other complementary organisational resources (Piccoli and Ives, 2005). Several complementary organisational resources that could be valuable components of IT-dependent strategic initiatives have been identified, but they could be grouped under the heading (1) physical, (2) human, (3) organisational, (4) reputation, and (5) financial resources.

2.2.2 IT Business Value Model

The contribution of IT to the improvement of various measures of organisation's performance metrics such as productivity, profitability, cost, differentiation and market share is variously termed as "IT business value", "strategic value of IT", "strategic advantage", "competitive weapons", and "IT-dependent strategy" by different researchers (Melville et al.,2004; Piccoli and Ives, 2005; Oh and Pinsonneault, 2007).We define IT business value as the outcome of implementation of IT resources in the construction project value chain on its performance metrics including cost, schedule, profitability, safety and stakeholders.

Many researchers have attempted to operationalise IT resources in order to measure the IT business value using a variety of formulations see for example (Ross et al., 1996; Bharadwaj, 2000; Dehning and Richardson, 2002; Melville et al.,2004; Piccoli and Ives, 2005). However, most of these constructs do not provide adequate methodologies measuring and analysing IT business value. Furthermore, there is no specific integrated IT business value model addressing the unique nature of the construction industry. To address this and other contextual issues we review the competitive strategic nature of the construction industry and propose an integrated model that will capture, measure and help benchmark the impact of IT-enable strategy in the industry.

2.3 Competitive Strategy in Construction

For the purpose of this research, the construction industry is considered as all organisations that engage in engineering consultancy, project management, architecture, procurement, and construction management activities (Betts and Ofori, 1992). The industry is project based with a typical project life cycle consisting of bidding and contractor selection, conceptual and detail engineering design, construction & construction management, and operation & maintenance. Successful delivery of this cycle for a project depends on the accuracy, effectiveness and timely communication and exchange of critical information and data between project teams. Despite the sizable contribution of construction to a nation's gross domestic product, the UK construction industry in particular is being criticized for its inefficiencies and has been identified as under-performing (Egan, 1998; Latham, 1994; Kagioglou et al. 2001). To improve the competitiveness of the sector through increased efficiency, communication and

productivity, a strategic use of IT is suggested in delivering construction projects (Zhen et al., 2005). Such strategy involved careful management of the construction value chain through deployment of IT resources couple with the organisational complementary resources.

2.3.1 Construction Project Value Chain.

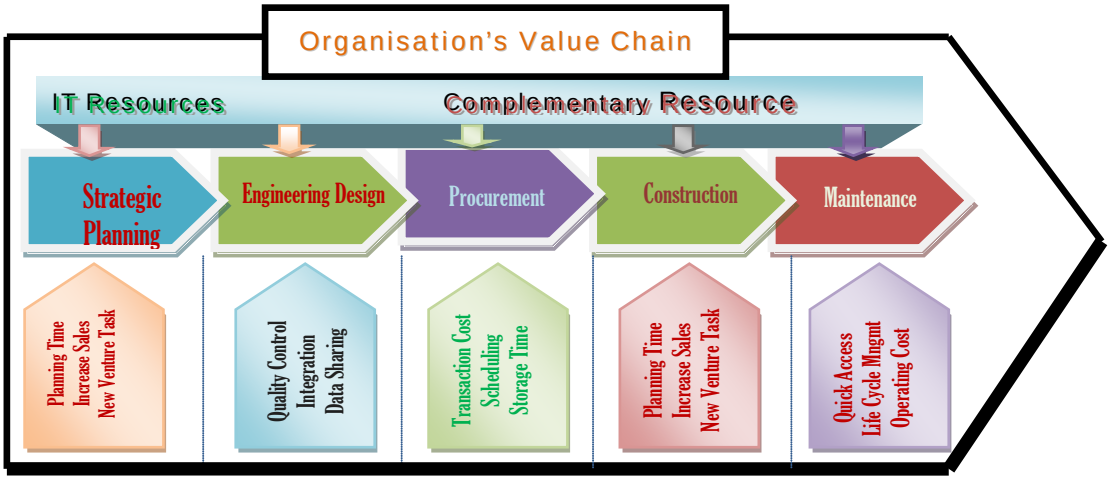

Figure 2. IT Resources and Construction Project Value Chain

Porter (1998) suggests that a systematic way of examining organisation business processes and how the individual activities interact to gain competitive advantage is by analysing the organisation's value chain. An organisation gains competitive advantage by performing these strategically important activities more cheaply or better than its competitors (Porter, 1998). However, Porter's (1985) value chain concept was derived with particular reference to manufacturing industries; therefore, some of its components cannot be directly applied to the construction industry. Since construction is a project based industry (Garnett and Pickrell, 2000), a value chain model for the sector has been developed as shown in Figure 2. The new model also has five primary activities which are further broken down into work functions. The detailed work functions for each primary activity of the value chain will be established in the subsequent phases of the research.

3 Research Questions

3.1 Research Questions

To increase the understanding of IT business value diffusion, implementation status, areas of application and the perceived benefits therein in the value chain of construction organisations; the research shall attempt to address the following question:

What are the possible impacts of IT Resources in providing a source of competitive advantage for construction organisations?

The research question is future broken down into hypotheses addressing different areas of the IT resources as defined in the literature review.

3.2 Research Hypotheses

Based on a detailed review of IT business value literature the following hypotheses on the impact of IT artefacts on the performance of construction organisation are derived. The IT resources identified in this study include IT infrastructure; IT capabilities comprising of IT Technical skills and IT Management Skill. Complementary organisation resources are considered in line with RBV to investigate their impact.

IT Infrastructure is the physical platform for sharing IT services across an organisation. It provides the foundation for the delivery of business applications and services. However, IT infrastructure may not be heterogeneously distributed across organisations, thus:

H_1: *The quality of the IT infrastructure will not be related to the competitive advantage of construction organisation.*

IT Business Application refers to any application that is important to running a business; this may include administration and decision support, engineering analysis, organisational communication, design and project management.

H_2: *Certain IT business applications will have positive impact on organisation performance.*

IT Technical Skills refer to the ability to design and develop effective information systems. Technical IT Skills are typically mobile as it is not difficult for competitors to hire away this value-creating resource from their competitors at their market price (Mata *et al.* 1995), giving rise to the following hypothesis.

H_3 *Technical IT skills alone will not have positive impact on the construction organisation performance*

IT Management Skills involve skills in managing IT projects, evaluating technology options, conceiving, developing, and exploiting IT applications and managing changes. Such skills are developed over time through accumulation of experience in a form of organisational learning. The theoretical concepts of IT management skills lead directly to the following hypothesis.

H_4: *Superior IT managerial skills will have positive impact in providing a source for construction organisation's competitive advantage.*

Although it is possible to apply IT resource for improvement of organisation performance, according to RBV to have sustainable competitive advantage it requires other complementary organisation resources to be mobilized and be in alignment with the IT-enable strategies. These complementary resources include the organisational policies, rules and work practices, organisational structure, workplace practices, and organisational culture among others.

H_5: Complementary organisational resources will have positive impact in sustainable IT business value.

Constructs	Dimension	Indicators
IT Infrastructure	Physical platform for sharing IT services	Computers, Local Area Network, number of workstations and terminal (Zhu, 2004)
IT Business Application	Implementation Level	Engineering, administration and management packages
IT Technical Skills	Proficiency in system analysis and design, programming	Qualifications, level of experience and training of IT staff
IT Management Skills	Managing IT projects, evaluating technology options	Qualifications, level of experience and training of CIO
Complementary Resources	Non- IT organisational resources	Strategy alignment, commitment of Management

Table 1 Operationalization of Construction Industry IT Resources Constructs

4 Research Methodology

Several disciplines such as strategic management, business administration, engineering, computer science, sociology and psychology; contribute to the study of the impact of information technology within organisations (Becker and Niehaves, 2007). Therefore the choice of paradigm for research in construction management has not been without debates. For more than a decade, the debate has been over the choice of ontological and epistemological concepts to adopt while conducting research in construction management (Seymour and Rooke, 1995; Raftery *et al.*, 1997; Runeson, 1997; Seymour *et al*,. 1997; Chau *et al*., 1998; Holt and Faniran, 2000).

The proponents of phenomenological inquiry insist that there is a need to apply a naturalistic approach when investigating issues related to construction management in order to understand the phenomena within its contextual setting. The positivists however argue for quantitative measures to help test hypotheses and possible generalisation. However, recently there is appreciation that construction management research requires hybrid approach and both paradigm could be deployed simultaneously (Blackwood *et al.*, 1997; Holt and Faniran, 2000; Peter *et al*., 2002). Chau *et al.*, (1998) proposed that construction management research should be in an era of methodology pluralism and paradigm diversity which can be characterised by arrange of researchers choosing to investigate problems from a range of paradigms using both qualitative and quantitative methods to investigate problems.

The current phase involves a comprehensive literature review in the field of IT business value, construction management and strategic management; identification and operationalisation of IT resources on the construction project value chain; establishing and defining project performance metrics as the major components of the conceptual IT business value model for construction organisations. The other phases involve case study and data gathering via mail questionnaire and analysis of data using Data Envelopment Analysis model.

The choice of DEA data analysis is aim at mitigating the shortcomings of lack of rigorous good quantitative measures for the output and value created by IT identified in

the literature. Based on the current literature review there is no known model using DEA to measure the IT business value in UK construction organisations.

4.1 Case Study Design

The second phase of the research shall involve conducting an unstructured interview in the form of case studies of selected construction firms in order to validate the suggested construction value chain and hence the conceptual model.

The choice of case study strategy at this phase of the research is informed by the requirement to carry out a holistic in-depth investigation of the complex phenomenon of IT business value of a construction organisation within the context it occurs (Benbasat *et al.,* 1987; Feagin *et al.,* 1991; Yin 1994).

The flexibility and versatility of the method allows for adoption of any philosophical perspective; positivist or interpretivist (Dube and Pare, 2003).

The validated conceptual framework will then be extended and modified through mathematical modelling using Data Envelopment Analysis. DEA is a technique for measuring the relative efficiency of organisational units. The methodology's main strength lies in its ability to capture the interplay between multiple inputs and outputs, a process that cannot be satisfactorily probed through traditional ratio analysis and does not require *a priori* assumptions (Gattouf *et al.,* 2004; Ruggiero, 2004; El-Mashaleh, 2007).

4.2 Questionnaire Survey

The third phase will involve empirically testing the model by collating data from sample organisations within the strategic grouping of the industry through a survey questionnaire. The sample size will be guided by the DEA literature requirements, which indicates that the minimum number of the sampled organisations (referred to as Decision Making Units- DMU) in any model should not be less than three times the number of variables in the model (Charnes, 1978; 1981). The adoption of survey questionnaire is to achieve efficiency in generating large amounts of data that can be subjected to linear programming analysis using the DEA. The questionnaire shall be designed with open-ended questions to support discovery of new information and to be mailed to respondents. The questionnaire shall be designed based on five-point Likert scale for measurement of the input and output variables.

The IT resources variables will be measured on the basis of usage rather than the dollar value, since the value derived is dependent on the level of usage (Kumar, 2004). The difficulties of getting dollar value of IT investments by the organization will be minimised by using managers' perception in answering the questionnaire as a barometer of IT business value (Tallon and Kraemer, 2006). The belief that perceptions are distorted and biased to the point of being irrelevant has also been disproved by research that finds a significant positive correlation between objective and perceptual measures of IT business value (Tallon and Kraemer, 2007).

5 A New IT Business Value Model for Construction Industry

Researchers have adopted diverse conceptual models and frameworks at different levels of analysis in the study of the impact of IT on organisational performance using theoretical paradigms from economics, strategy, accounting, and operations research, philosophy, and sociology (Brynjolfsson 1993; Brynjolfsson and Yang 1996; Dedrick et al., 2003; Wilson 1995; Melville et al., 2004).

We recognise the limitation of previous studies that focused on an aggregate organisation level of analysis thereby ignoring the intermediate processes through which IT impacts on organisation's performance (Barau et al; 1995). Therefore, the paper presents a conceptual model of IT business value in construction through a web of intermediate levels of construction project activities, in line with the value-chain analysis suggested by Porter (1985) in Figure 3.

The IT and complementary resources construct as illustrated in Table 1 forms the inputs to the construction project value chain in Figure 2. The output measures are represented by the project performance metrics, thus establishing the productivity, efficiency and effectiveness of the IT on the value chain. The model assumes the presence of IT investment within the focal organisations to provide a basis to investigate the impact of such IT resource on performance. The measure of the investment in operationalisation of the model will be based on the level of application and diffusion in the sampled organisations.

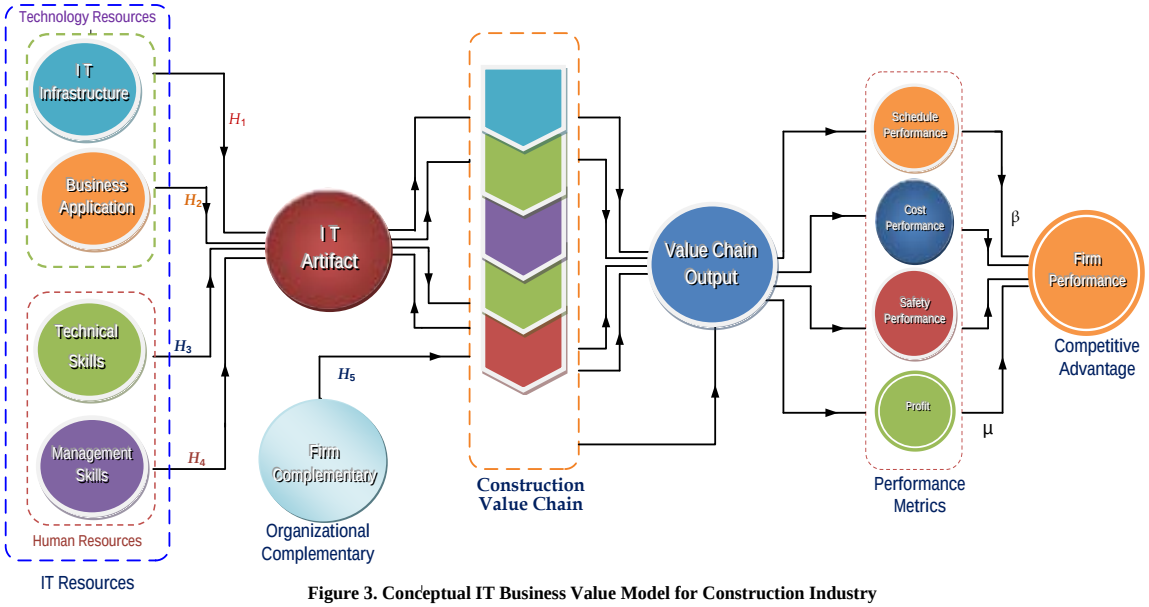

Figure 3. Conceptual IT Business Value Model for Construction Industry

5.1 Measuring the IT Business Value on Construction Organisations

Despite significant progress in recent years, there is still lack of agreed metrics to assess IT business value (Kohli and Devaraj, 2003). IT investment appraisal is more difficult than other investment decisions because costs and benefits are hard to identify and quantify. The contemporary IT investment evaluation approach has focused on quantitative financial assessment and traditional appraisal methods (Chen *et al.*, 2006;

Tallon and Kraemer, 2006). Also construction organisations performance measurement has been mostly there criticized as narrow (Bassioni et al., 2004).

Performance Metric	Measurement
Schedule e	%of the time projects are delivered on or ahead of schedule
Cost e	%of time projects are delivered on or under budget
Customer	% of repeat business customers
Safety	Experience Modification Rating (EMR)
Profit	Net Profit after tax as a %of total sales

Table 2. Construction Project Performance Metrics (El-Mashaleh *et al*., 2006)

Metrics for measuring construction project performance such as schedule performance, cost performance, customer satisfaction, safety performance, and profit in line with El-Mashaleh *et al*. (2006) are adopted in this paper as operationalisation in Table 2. Using the IT resources as the inputs and the measure of project performance metrics as the outs the composite organisation performance index will be determined using DEA. The best performing organisation will form the efficient frontier with which other organisations could be compared and benchmarked

6 Conclusions and Further Work

The literature review in the fields of IT business value, strategic management and construction management has identified that the equivocal results of the previous studies of IT business value were attributed to the difficulties in modelling and measurement of the return of IT investment, lack of structured theoretical constructs, data availability and choice of dependent variables among others. This study is aim at contributing the process of mitigating these drawbacks.

The two dominant theories of Porter and RBV in the strategic management literature are used as the theoretical construct for this study. Applying Porter's value chain constructs allows for examining the intermediate and context related variables of IT resources and their impacts on the performance of construction organisations. The RBV set the basis of how complementary resources are use to support the IT-enable strategy to achieve CA. This framework is used in this paper to derive the conceptual model of IT business value in construction organisation that is aim at mitigating some of the difficulties identified in the literature.

The subsequent phases of the research will validate the assumptions associated with the conceptual model through case study. A non-parametric linear programming analysis using DEA will be applied to the validated model for empirical testing of the model.

The lag between IT investments and the realisation of the benefits that the data collection methodology used in the previous studies that may not account for will be reduced by considering data inputs of over 3 year period and projecting annual compound growth rates for the output over 5 years. The data collection will be through

questionnaire survey, and the sample size of the organisations will be guided by the DEA literature requirements.

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Identifying Contractor 'Input' Factors for Predicting Performance Levels - A case study in Hong Kong

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Abstract:
A 'price only' evaluation mechanism in tender selection processes is still causing problems in construction industry practice. Other selection criteria have been recommended by many researchers, where some 'multi-criteria' selection models have also been introduced. However, many clients still doubt the reliability and objectivity of non-price-based tender evaluation criteria. Furthermore, recommendations from a model system with the same criteria and fixed weightings of each criterion will not suit different clients and diverse projects. The above background led to this proposal for a dynamic and flexible decision support system for contractor selection. Among the multiple criteria embedded in the proposed system, consolidated past performance is seen as one of the most important parts. To address this need, a case study, based on an on-going review of the present Performance Assessment Scoring System (PASS) in the Hong Kong Housing Authority (HKHA), is presented in this paper. Performance scores of 39 housing projects done by 6 contractors were analyzed to find out the relationships between 'inputs' and outputs. Studying PASS data also contributes to selecting potential factors that can be used for predicting performance. Later, these findings will help to generate a questionnaire to contractors, clients and consultants in Hong Kong to identify critical factors, which can predict the performance of contractors most effectively and reliably.

Keywords:
Construction, Hong Kong, Performance Assessment, Prediction, Tender Evaluation

1 Introduction

A purely price-based approach to contractor selection has been extensively used for many years, but has caused many problems in practice. Choosing the cheapest offer has led to many examples of shoddy construction, low quality, as well as avoidable claims and disputes. Supplementary selection criteria like past performance, financial status, technical capacity and team-working potential have been recommended by many researchers, while some have been introduced in practice. Researchers have conducted

many studies on how to select the 'best' contractor, using various approaches, such as: "analytic network process" (Cheng and Li, 2004), "web-based sub-contractor evaluation system (WEBSES)" (Arslan et al., 2008), "Fuzzy pattern recognition approach" (Li et al., 2005), "probabilistic-possibilistic approach" (Prascevic and Petrovic-Lazarevic, 1996), "multi-criterion decision-making model" (Assaf and Jannadi, 1994), "Fuzzy decision framework" (Singh and Tiong, 2005), and an additive model using multi-criteria utility theory (Hatush and Skitmore, 1998). All the above studies used "multi-criteria" decision models. However, considering the unique character of each project and the different concerns of diverse clients, a single standardized decision making system cannot provide a universal solution. Instead, it is proposed to provide more information together with appropriate tools for each client to make project specific decisions.

For this purpose, a 'consolidated past performance information system is proposed as a major contributor to facilitate better-informed decisions when selecting contractors. Past performance will be one of the important selection criteria in the proposed system. For this, it is necessary to effectively and reliably assess and record the performance of contractors on their on-going works in order to select the 'right' contractors for future works. A case study, based on an on-going review of the present Performance Assessment Scoring System (PASS) in the Hong Kong Housing Authority (HKHA, 2007), was carried out and is presented in this paper. Previous assessment scores from the PASS system were obtained from the Hong Kong, Housing Authority, and used to identify and analyze any relationships between the 'inputs' and 'outputs' sections. This helps to identify the more 'important' assessment criteria and hence improve future assessments and performance prediction. Next, the findings, from this case study, together with results from a planned questionnaire will be used in formulating a Decision Support system for Contractor Selection - incorporating consolidated past performance information. The envisaged research output can help construction clients who use the system to eventually access more information based on consolidated past performance and thereby make better contractor selection and related decisions.

2 Background

2.1 Literature Review

For many years in the construction industry, purely price-based contractor selection has been extensively used to obtain cheap prices and/or to avoid controversy. But choosing the cheapest offer often leads to problems including sub-standard quality, cost over-runs, delays and hence, false economics, as well as escalated claims and disputes etc. (Crowley and Hancher, 1995; El Wardani et al., 2006; Kumaraswamy, 2006; Palaneeswaran et al., 2007; Russell and Skibniewski, 1990). Also, as mentioned by Singh and Tiong (2006), "the construction industry has also witnessed the failure of contractors due to varying reasons such as financial problems, poor performance, or accidents arising from the lack of adequate safety consideration at work sites." Cheng and Li (2004) confirmed that the performance of the project would be affected if the method for selecting the most appropriate contractors were not proper and reliable.

Studies have shown that a "price-only" contractor selection system is inefficient in selecting the most capable contractors that have capacities to finish the project

successfully with a win-win result. Always choosing the lowest price tender may cause many problems, and final costs and durations may then turn out to be much more than those that may have resulted from choosing the 2nd (or 3rd) lowest bid. Other non-price evaluation criteria have been introduced into tender selection processes e.g.: financial stability, any failure to complete previous projects, experience, successfully completed projects, quality levels achieved, culture factors, financial strengths/ weaknesses, key personnel, organizational structure, management and technological resources (Holt et al., 1994; Kumaraswamy et al., 2007; Kumaraswamy, 1996; Russell et al., 1992; Russell and Skibniewski, 1988).

One of the important criteria that recurs in the above studies is past performance of the candidate contractors. The reason for past performance of contractors being important is because using a performance modelling process, we may predict the "multiple project performance outcomes for candidate contractors" (Alarcon and Mourgues, 2002). Furthermore, some contractor performance evaluation models have been developed and published by some researchers, like CQP evaluation model in pavement projects (Yasamis, 1999), QUALICON: Computer-Based System for CQM (Battikha, 2002), e-reporting system for contractor's performance appraisal (Ng et al., 2002). Apart from theory, there are already some evaluation and information reporting systems used in practice by different agencies, like the Performance Assessment Scoring System (PASS) of the HK Housing Authority; Construction Quality Assessment System (CONQUAS) of the Building & Construction Authority, Singapore; both (a) the Contractor Performance Index System (CPIS), and the (b) Formula Approach & Marking Scheme Tender Evaluation Approach of the HK Works Branch of the HK Development Bureau; Counterparty Management Information System (COMIS) of the HK Housing Authority; Contractor Performance Assessment Reporting System (CPARS) of the US Naval Sea Logistics Centre Detachment Portsmouth; a website named 'Contractor Power' in U.K. providing contractors' basic information, a website providing information on contracts by or on behalf of 'Statistics Canada'. A comparison of the main Features of the above systems is shown in Table 1:

Table 1. Comparison of features between some existing systems

SYSTEM NAME	REGION	Contractor Evaluation	Information Storage	Data available to:	Project based	Multi-criteria
PASS	HK SAR	Y	Y	HKHA^	Y	Y
CONQUAS	Singapore	Y	Y	Public/ Government	Y	Y
Contractor Performance Index System	HK SAR	Y	N	HKWB#	N	Y
Formula Approach	HK SAR	Y*	N	HKWB#	N	Y
Marking Scheme	HK SAR	Y*	N	HKWB#	N	Y
COMIS	HK SAR	N	Y	HKHA^	N	Y
CPARS	U.S.	Y	Y	U.S. Navy	Y	Y
Contractor Power	U.K.	N	Y	Public	Y	Y
Statistics Canada	Canada	N	Y	Public	Y	Y

*: for tender evaluation. ^: Hong Kong Housing Authority #: Hong Kong Works Branch

As seen from Table 1, Hong Kong has adopted a few different performance assessment, information collection, storage and evaluation systems. Among the systems used in Hong Kong, PASS is the one with the most features/functions. In this respect, it is also the most complex one. The system has been applied for almost 20 years, and accumulated a large volume of data on contractor performance assessment. Our case study was therefore carried out on this system.

2.2 Performance Assessment Scoring System (PASS)

The PASS system was introduced by the Hong Kong Housing Authority (HKHA) in 1990 to monitor its contractors in a more effective way. The main functions of the system are for work performance monitoring; for HKHA's contractor list management (to maintain an up-dated list of 'registered' contractors); as well as for applying in the tender process, both for selection of tenderers and also to inform tender assessment. The main skeleton of the system is as follows:

SW - Structural Works Assessment
AWI - Architectural Works (Interim) Assessment
AWF - Architectural Works (Final) Assessment
SA - Safety Assessment
SA1 - score for Safety & Health Management System
SA2 - score for Implementation of the Safety & Health Plan
SA3 - General Site Safety
SA4 - Block Related Safety
PA - Programme and Progress Assessment
PA1 - Programming
PA2 - Milestone Dates (Building Service)
PA3 - Milestone Dates (Prior to Completion)
PA4 - Milestone Dates (Structural Works)
PA5 - Milestone Dates (Architecture Works)
OOE - Environmental and Other Obligations Assessment
OOE1 - Environmental, Health and Other Provisions
OOE2 - Site Security, Access and Storage of Materials
IA - Management Input Assessment
IA1 - Management and Organization of Works

IA2 - Resources
IA3 - Co-ordination and Control
IA4 - Documentation
MPA - Maintenance Period Assessment
MPA1 - Outstanding Works
MPA2 - Defects and Works of Repair
MPA3 – Management, Co-ordination and Documentation

We can see from the PASS structure that, assessment **criteria** a, b and c are more about the output assessment, which assess the quality of the final product, either from the structural side or from the architectural side. These three assessment criteria contribute to 70% of the final project score during the construction period. On the contrary, assessment criteria d - g are more concerned with assessing general issues, with more emphasis on project process control. The results in these '**sections'** can reflect the effort the contractor has put into the project in some degree and can also reflect the influence that 'input factors' have had on the project. These four sections contribute to 30% of the final project score during the construction period. Assessment criterion h is to assess the contractor's performance during the maintenance period, which is normally 24 months.

Most of the assessments are done on a quarterly base. PASS adopts a 4 quarter rolling measurement, which means the scores in the past 4 quarters will be used to generate the project score. Then the arithmetic average of the projects scores for all the projects done by the contractor in the preceding 4 quarters will be calculated as the contractor score. This contractor score will be used in the tender opportunity allocation process and tender selection process in the current quarter.

The reported case study focuses on testing whether a better performance in the General Assessment will influence a contractor's performance in the Output Assessment or not, and furthermore to identify the factors that can be used for predicting performance. Indeed, once any relationship between the input factors and output factors has been identified, then we may use these factors for predicting performance. In short, it is hypothesised that better performance against criteria d to g (which can be taken as 'input' factors) can help generate a better quality of the final product of the project ('output' criteria/ factors a to c).

3 Research Methodology

There are 329 contractors registered with the Works Branch of the Development Bureau of Hong Kong SAR government, while 150 out of them are registered for building works. However, this paper focuses on public housing contractors. Sample data was obtained from the Hong Kong Housing Authority, including PASS score data of 6 contractors over three years up to Sep. 2006. The contractors were selected from Housing Authority's registered new works (building) contractors list, which incorporates 46 contractors, according to their historical performance levels. Two contractors were randomly selected from each of the 'high', 'medium' and 'low' levels. The 6 selected contractors had a total of 39 projects records within Sep. 2003 to Sep. 2006. All this data was used in the analysis, except for project 31 which started in mid-2006.

The Structural Works (SW) score, Architectural (Interim) (AI) score, Architectural (Final) (AF) score and together with Works score, which is the average of the SW and AI, are used to represent the 'output' results of these projects. All the assessments were on a quarterly basis and the overall averages are calculated for each assessment criterion of the project. On the other hand, the overall average of Safety Assessment (SA), Programme and Progress (PA), Environmental and Other Obligations (OOE) and Input Assessment (IA) were used to represent the efforts ('input' factors) of the contractors on their projects.

The averages of each of the above Input factors are also calculated project by project. In order to find out the relationships between the different scores, the Pearson product-moment correlation between the scores were analyzed. In statistics, the Pearson product-moment correlation coefficient is a common measure of the correlation (linear dependence) between two variables X and Y. It is very widely used in the sciences as a measure of the strength of linear dependence between two variables. The SPSS software was used to find out the Pearson Correlation between the two groups of scores. In the output table given by SPSS, the square of 'Pearson Correlation' is conventionally used to explain to what extent the variance of Y can be 'explained' by changes in X and the linear relationship between X and Y. Meanwhile the significance level of the correlations indicates the importance of the association between the two groups of variables. The lower the significance level, the more significant is the relationship between the two variables.

Next, a more detailed analysis was carried out to find any deeper relationship between the two groups of scores ('inputs' and 'outputs'). The average scores under each input aspect were calculated and analysed against 'output' in turn. In this way, we try to find out whether the differences in input scores had any impact on the output scores, and meanwhile, also assess whether the system had any room for improvements.

4 Findings and Discussion

In the first exercise, the overall average of the Output scores and Input aspect scores are used to generate the following 'correlation table'. The highlighted items in Table 2 indicate pairs with significant correlation.

We can observe from the table that, the overall **PA** score has a 0.05 level significance correlation with **WS** and **SW**. This may be explained if a better control of programme and progress can imply that the contractor is better organised, and that this will probably help achieve better quality workmanship as well. Meanwhile, a 0.01 level significance correlation between **SA** and **AF** scores is observed. This relationship can not be explained at first sight, so it will be revisited in the later analysis. Another interesting result within the general assessment themselves, are the 0.01 level significance correlations between the **PA** and **IA**, and **OOE** and **SA**. It seems that the input assessments may have been divided into two groups. This may be because **PA** and **IA** relate more to people, management and resource issues, while **OOE** and **SA** relate more to environmental, safety and health construction site issues.

Table 2. Correlations between Output and Input Scores

		WS	SW	AI	AF	IA	PA	SA	OOE
WS	Pearson Correlation	1	.314	.211	.240	.039	.369(*)	-.170	-.178
	Sig. (2-tailed)		.075	.238	.294	.833	.038	.354	.329
	N		33	33	21	32	32	32	32
SW	Pearson Correlation		1	.259	.383	.294	.434(*)	.180	.092
	Sig. (2-tailed)			.117	.065	.096	.012	.316	.612
	N			38	24	33	33	33	33
AI	Pearson Correlation			1	.341	-.086	-.072	-.210	-.013
	Sig. (2-tailed)				.103	.632	.691	.242	.942
	N				24	33	33	33	33
AF	Pearson Correlation				1	-.008	-.038	.605(**)	.346
	Sig. (2-tailed)					.971	.871	.004	.124
	N					21	21	21	21
IA	Pearson Correlation					1	.458(**)	-.058	-.033
	Sig. (2-tailed)						.007	.749	.856
	N						33	33	33
PA	Pearson Correlation						1	-.162	-.177
	Sig. (2-tailed)							.369	.325
	N							33	33
SA	Pearson Correlation							1	.732(**)
	Sig. (2-tailed)								.000
	N								33
OOE	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Correlations between Output and Safety Assessment Scores

		WS	SW	AI	AF	SA1	SA2	SA3	SA4
WS	Pearson Correlation	1	.314	.211	.240	.343	**.435(*)**	-.228	.030
	Sig. (2-tailed)		.075	.238	.294	.059	.014	.201	.872
	N		33	33	21	31	31	33	32
SW	Pearson Correlation		1	.259	.383	.242	.102	-.118	.208
	Sig. (2-tailed)			.117	.065	.168	.564	.480	.231
	N			38	24	34	34	38	35
AI	Pearson Correlation			1	.341	.018	.318	-.052	-.129
	Sig. (2-tailed)				.103	.918	.067	.757	.460
	N				24	34	34	38	35
AF	Pearson Correlation				1	**.620(**)**	**.543(**)**	.387	**.625(**)**
	Sig. (2-tailed)					.002	.007	.062	.001
	N					23	23	24	23
SA1	Pearson Correlation					1	**.505(**)**	.290	.328
	Sig. (2-tailed)						.002	.097	.063
	N						34	34	33
SA2	Pearson Correlation						1	.120	.045
	Sig. (2-tailed)							.499	.805
	N							34	33
SA3	Pearson Correlation							1	**.349(*)**
	Sig. (2-tailed)								.040
	N								35
SA4	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

In the second exercise, the Input aspects were broken down to the more detailed level, and correlation analyses conducted accordingly. Table 3 shows the correlation between Output scores and the Safety assessment scores, in the first part of this second exercise.

In the safety assessments, the **SA1** and **SA2** scores are drawn from quarterly safety audit reports, which must be checked and verified by the Occupational Safety and Health Council, after each safety audit by the appointed independent auditor. On the other hand, **SA3** and **SA4** were assessed by an independent assessing team from HK Housing Authority. Table 3 shows that **SA1**, **SA2**, **SA4** had quite significant correlations with **AF** scores, while **SA2** had a 0.05 level significance correlation with **WS**.

Next, in the second part of this second exercise, the correlation between Output scores and **PA**, **OOE** and **IA** are also ascertained. The results are in Tables 4, 5 and 6:

It is seen from Table 4, that most of the **PA** scores are correlated with **SW**, which is because keeping within programme will probably leave room for better workmanship. An interesting result is that **PA5**, which is Milestone Dates (Architectural Works), has a 0.01 level significance correlation with Structural Works. This may possibly be explained since **PA5** has 0.01 level significance correlations with **PA3** and **PA4**, while

Table 4. Correlations between Output and Programme & Progress Assessment Scores

		WS	SW	AI	AF	PA1	PA2	PA3	PA4	PA5
WS	Pearson Correlation	1	.314	.211	.240	.008	.497(*)	.128	.450(*)	.125
	Sig. (2-tailed)		.075	.238	.294	.967	.019	.603	.021	.553
	N		33	33	21	33	22	19	26	25
SW	Pearson Correlation		1	.259	.383	.367(*)	.127	.443(*)	.445(*)	.517(**)
	Sig. (2-tailed)			.117	.065	.024	.544	.039	.023	.008
	N			38	24	38	25	22	26	25
AI	Pearson Correlation			1	.341	-.189	.288	-.123	.180	-.070
	Sig. (2-tailed)				.103	.255	.163	.585	.379	.741
	N				24	38	25	22	26	25
AF	Pearson Correlation				1	.068	.023	.086	-.039	-.007
	Sig. (2-tailed)					.751	.914	.705	.889	.974
	N					24	24	22	15	21
PA1	Pearson Correlation					1	.114	.243	.190	.331
	Sig. (2-tailed)						.586	.276	.353	.106
	N						25	22	26	25
PA2	Pearson Correlation						1	.137	.512(*)	.272
	Sig. (2-tailed)							.544	.043	.220
	N							22	16	22
PA3	Pearson Correlation							1	.678(*)	.661(**)
	Sig. (2-tailed)								.011	.002
	N								13	19
PA4	Pearson Correlation								1	.761(**)
	Sig. (2-tailed)									.000
	N									19
PA5	Pearson Correlation									1
	Sig. (2-tailed)									
	N									

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

PA3 and **PA4** have more close relationships with **SW**, hence the apparent **PA5** relationship with **SW**. It is also interesting to see that **PA5** does not have a significant correlation with **AI** or **AF**. This is difficult to explain at this stage, hence more attention will be paid to this at subsequent preliminary interviews and questionnaire design stage.

Table 5 shows that **OOE1** has a more significant correlation with **AF**, but does not indicate any other significant relationship here.

Table 5. Correlations between Output and Environmental and Other Obligations Scores

		WS	SW	AI	AF	OOE1	OOE2
WS	Pearson Correlation	1	.314	.211	.240	-.073	-.080
	Sig. (2-tailed)		.075	.238	.294	.687	.658
	N		33	33	21	33	33
SW	Pearson Correlation		1	.259	.383	.128	.112
	Sig. (2-tailed)			.117	.065	.445	.501
	N			38	24	38	38
AI	Pearson Correlation			1	.341	.050	.090
	Sig. (2-tailed)				.103	.767	.592
	N				24	38	38
AF	Pearson Correlation				1	.441(*)	.264
	Sig. (2-tailed)					.031	.212
	N					24	24
OOE1	Pearson Correlation					1	.140
	Sig. (2-tailed)						.402
	N						38
OOE2	Pearson Correlation						1
	Sig. (2-tailed)						
	N						

* *Correlation is significant at the 0.05 level (2-tailed).*

Table 6 shows an interesting phenomenon in that the **IA** score doesn't have any level of significant correlation with the Output scores. We may expect that the Input Assessment scores should have some kind of influence on the Output scores, because the **IA** is what directly assesses how much inputs the contractor has dedicated to the project. More attention is thus needed here. For example questions may be raised (and tested) as to whether **IA** measures realistically reflect the critical (performance-impacting) efforts of the contractor, or not. This can be embedded in the envisaged questionnaire survey and interview formats. The results may also help further improvements in the PASS system.

5 Conclusion and Further Research

In this case study, potential statistical relationships between the 'input' factors and 'output' factors from a sample of public housing construction projects, were tested and identified. Correlation analyses between various Input and Output scores helped to identify the more 'significant' (and potentially critical) factors. The input assessment results do indicate some significant correlations with output scores. Also many of the 'input' factors showed some correlations with some 'output' factors. It is therefore hypothesised that these 'input' factors can be used, possibly among others as will be ascertained in follow-up work, as performance assessment criteria. These could then also be used for predicting future performance as well.

However, this part of the study does have some limitations and needs more work before the final performance predicting criteria can be reliably identified. Firstly, the initial study was only based on statistical analyses. Also, while the assessment period of the available data was from Sep. 2003 to Sep. 2006, the current PASS manual was published in Jan. 2007. However, the changes were checked and found to not affect

Table 6. Correlations between Output and Input Assessment Scores

		WS	SW	AI	AF	IA1	IA2	IA3	IA4
WS	Pearson Correlation	1	.314	.211	.240	.009	.127	.151	.192
	Sig. (2-tailed)		.075	.238	.294	.962	.480	.400	.283
	N		33	33	21	33	33	33	33
SW	Pearson Correlation		1	.259	.383	.155	.179	.262	.121
	Sig. (2-tailed)			.117	.065	.351	.282	.112	.471
	N			38	24	38	38	38	38
AI	Pearson Correlation			1	.341	-.217	-.022	-.078	-.135
	Sig. (2-tailed)				.103	.191	.895	.643	.418
	N				24	38	38	38	38
AF	Pearson Correlation				1	-.032	-.148	-.006	-.087
	Sig. (2-tailed)					.881	.489	.977	.687
	N					24	24	24	24
IA1	Pearson Correlation					1	.390(*)	.411(*)	.328(*)
	Sig. (2-tailed)						.015	.010	.045
	N						38	38	38
IA2	Pearson Correlation						1	.142	.187
	Sig. (2-tailed)							.394	.261
	N							38	38
IA3	Pearson Correlation							1	.725(**)
	Sig. (2-tailed)								.000
	N								38
IA4	Pearson Correlation								1
	Sig. (2-tailed)								
	N								

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

areas studied significantly; hence the results are still valid. From a broader perspective, the study to date has been more quantitative, while there are many other factors that can affect the scores, as well as the explanations of the results. Secondly, the research was based on a single system adopted in Hong Kong by one client, albeit a major player in the Hong Kong construction industry. More case studies should be conducted and/or opinions solicited via questionnaire, interviews and/or a focus group.

Apart from the above limitations, the completion of this case study is the first major step in the first author's research. The results from this case study, together with the

information gained from preliminary interviews and literature reviews, will be used to generate a questionnaire survey, which will be sent to clients, contractors and consultants in the Hong Kong. Next, the consolidated results will be used to formulate a framework for a contractor selection decision support system that incorporates more reliable and consolidated past performance information. The system will provide more information about contractors as well as their past project performance to facilitate clients' decisions during the contractor prequalification and tender selection processes.

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Evaluation of the Financial Perspectives on Institutional Facility Management

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Abstract:
This research applies Key Performance Indicators "KPIs" to assess facility management in high educational institution. The analysis compromises 28 institutional buildings and 11 major components which are: disability access compliance, civil engineering work, conveying systems, electrical systems, exterior envelop, HVAC systems, interior finishes, plumbing systems, trash removal, structural components & fire protection. It evaluates maintenance effectiveness, benchmark the facility management and compare it with known international institutions, and to recommend measures required to improve its performance. Four perspectives of the balanced scorecard were utilized in this research; Financial; Internal business processes; Learning and Growth; and Customer. It showed that the facility management lacked effective strategic plan and according to the balanced score card the rating of the facility against average facility condition is Good to Fair in all areas except in one which is rated Poor. It also showed gap between APPA "The Association of Higher Education Facilities Officers" guidelines and the current facility on the deferred maintenance.

Keywords:
Balanced Score Card, Facility Management, APPA, Key Performance Indicators, Financial Perspectives

1 Introduction and Background

The institutional facility compromises 242,526 gross square feet, which includes landscaping, administrative buildings, research, four academic colleges, student's residences, faculty & staff residences & other support buildings. This is served by about 40 regular Physical Plant employees and about 150 contracted workers, working to provide the following services: Planning, Design, and Installation of construction and renovation projects; Building maintenance; Preventative maintenance; Corrective maintenance; Equipment repair; and Custodial services.

The facility has experience dramatic growth in the last 8 years in both students and the number of buildings. Total enrolment grew over 400% from 900 students to over 4000 students. The total constructed area grew from 252,753 Square feet to 13,631,868 Square feet at the same period of time. In addition, as a result of surging demand for capital, much construction was completely hasty and because of fast construction, little consideration given to a facility's longevity, adaptability, standards for fire and safety

codes, handicapped access and hazardous waste disposal. The required modifications have to carry out by physical plant in addition to its regular maintenance functions, added to this; the Physical Plant has been facing budgetary pressures. Escalating costs, funding cutbacks contributed to tight budgets and left difficult options for Physical Plant Planners to properly manage the facility.

Many educational institutions are faced with the challenge of expanding and managing their facilities. The role of project management functions within a facility management group is to oversee and coordinate the design and construction of new facilities and to renovate older facilities. The organizational structure and processes of such project management group affect the cost, quality, and duration of any project. Much study has been made of the theoretical methods to analyze organizational effectiveness and efficiency. Thompson (1967) and Galbraith (1977) provided a foundation for building analysis tools based on the view of organizations as information processing units operating in specific environments. In project management, this foundation resulted in various analysis techniques. Clayton (1995) studied 15 facility management organizations and found that the outsourcing of certain services for one firm did not make sense for others. Clayton further concluded that there was a need for a functional analysis tool to help organizations identify the value-adding functions and develop a sound strategy.

Researchers have highlighted the importance of various dimensions in the development of performance measurement system. For example, Bititci et al. (1997) have exploited two dimensions of performance measurement: integrity and deployment. They refer integrity as the ability of the performance measurement system to promote integration between various areas of the business and realized the latter necessary to match the performance measures used at various levels with the business objectives. The balanced scorecard approach provides a comprehensive framework that translates a company's strategic objectives into a coherent set of performance measures. The biggest strength of the balanced scorecard, compared to other frameworks, lies in its ability to link performance among different classes of business performance; financial and non-financial, internal and external. Measures that are aligned with strategy, not only provide information on whether the strategy is being implemented, but also encourage behaviors consistent with the strategy, and also support the progress against pre-determined objectives, without sub-optimization (Neely, 1998a; Amaratunga et al., 2002). The essence of the balanced scorecard is the acceptance that some performance criteria conflict, and thus, the task of management is to resolve these conflicts, to achieve a balance of objectives. Therefore applying effective Facility Management "FM" will help to identify potential problems with maintenance and running costs before they result in component breakdown and even temporary shutdown of buildings. It can provide a disciplined framework for the examination of many of the relationships between decisions and the satisfaction of the end user of the property, whether in economic or environmental terms. It also provides a framework for the review of user satisfaction as business and other circumstances change. It is clear that FM is an umbrella term under which a wide range of property and user related functions may be brought together for the benefit of the organization and its employees as a whole. Therefore, the aim of FM should be not only optimizing running costs of buildings, but to raise the efficiency and sustainability of management of space and other related

assets for people and processes. Therefore, the mission and goals of Institution may be achieved at the best combination of efficiency, cost and quality. Performance, in business terms, means the manner or quality of functioning. This implies that management performance is concerned with the manner or quality of managing. The assessment of work performance existed throughout man's history. In modern times, beginning with Taylor around the turn of the twentieth century with his measurement of productivity (Cole, 1993), interest in the assessment of performance has shown accelerated growth up to the present day.

The research investigates the performance evaluation, accuracy and verifiability of data, approaches for different financial strategies, and supervision of capital budget.
There have not been any research and assessment carried out neither on the current institution nor in any of the surrounding institutions. The findings are compared with similar international research findings on higher educational institutions such as data published by Rush and Johnson, 1989; Transfield and Akhlaghi, 1995; and NACUBO, 1998.

2 Methodology

The Balanced Scorecard is a concept developed by Robert S. Kaplan, professor at the Harvard Business School, and David P. Norton, president of Renaissance Solutions, Inc. They developed it as a tool for managers to mobilize their people for achieving organizational goals. The scorecard with its four perspectives is shown on table 1.

1. Financial
2. Internal business processes
3. Learning and Growth and
4. Customer

	Financial Perspective	**Internal Perspective**	**Innovation & Learning Perspective**	**Customer Perspective**
Performance Indicators	Facility Operating CRV Index Facility Operating GSF Index Facility Operating GIE Index Capital Renewal Index Facilities Condition	Cycle Time Average Age Backlog index Energy Usage Index Energy Reinvestment Index	Work Environment Index High Score Index Top Box-Bottom Box Index Organizational Change assessment	Work Environment Index High Score Index Top Box-Bottom Box Index Organizational Change assessment

	Index			

Table 1: The Balanced Score Card Performance Indicators

In this study comprehensive research has been conducted to analyze Key Performance Indicators "KPI" of the financial perspective.
The KPI's measured in this perspective were.

- Facility Operating CRV Index
- Facility Operating GSF Index
- Facility Operating GIE Index
- Capital Renewal Index
- Facilities Condition Index

The Facility operating CRV Index: This indicator represents the level of funding provided to meet the stewardship responsibility of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditure to current replacement value (CRV) obtained from the facility audit, and annual facility maintenance operating expenditure was obtained from finance.

CRV Index = Annual Facility Maintenance Operating Expenditures (Dhs)/Current Replacement Value (Dhs)
[Note: Dhs is abbreviation of Dirhams which is UAE national currency; 1US$ ≈ 3.68 Dhs]

The Facility Operating GSF Index: This indicator represents the level of funding provided for stewardship of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditures to the institution's gross square feet (GSF), the GSF was obtained during the facility audit & annual maintenance operating expenditure was obtained from the finance department.

GSF Index = Annual Maintenance Operating Expenditure (Dhs) / Gross Square Feet (GSF)

In order to measure the KPI's of the Financial Perspective, the first step is to conduct the facilities audit. To conduct the facilities audit the entire Institution was broken down into individual buildings. The 47 resulting buildings were individually evaluated in 11 major components: disability access compliance, civil, conveying systems, electrical systems, exterior envelop, HVAC systems, interior finishes, plumbing systems, trash removal, structural components & fire protection. The primary source of information on the components was the current university staff and trades men. They are in the facilities daily and generally know what systems were performing adequately and which were substandard. I interviewed the entire range of university staff members to get a good list of the perceived problems. Many of the university staff members were organized in disciplines (i.e. electrical, plumbing, HVAC, etc), after recording the interviews, a through building by building visual inspection was carried out with the help of physical plant staff and a series of tables were filled.

Facility Operating GIE Index: This indicator represents the level of funding provided for the stewardship of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditure to the institution's gross institutional expenditures (GIEs). The annual facility maintenance operating expenditures & gross institutional expenditures were obtained from the finance department.

GIE Index = Annual Facility Maintenance Operating Expenditures (Dhs)/Gross Institutional Expenditures (GIE)

Capital Renewal Index: This indicator shows the institution's level of funding effectiveness in addressing its identified capital renewal and renovation/modernization needs. The capital renewal, renovation/modernization expenditure were obtained from the finance department and current replacement value was obtained from market rates of construction.

Capital Renewal Index = Annual Capital Renewal and Renovation / modernization Expenditure (Dhs) / Current Replacement Value (Dhs)

Facilities Condition Index: The facilities Condition Index (FCI) is a comparative indicator of the relative condition of facilities. The FCI is expressed as a ratio of the cost of remedying maintenance deficiencies to the current replacement value. The FCI provides the facilities professionals with a method of measurement to determine the relative condition of a single building, a group of buildings a corresponding rule of thumb for the annual reinvestment rate (funding percentage) to prevent further accumulation of deferred maintenance deficiencies. The deferred maintenance deficiencies and the current replacement values are arrived at from the facilities audit.

Facility Condition Index = Deferred Maintenance Deficiencies (Dhs) / Current Replacement Value

3 Calculations and Analysis

Facility operating CRV Index: The facilities operating expenditures are those required for ongoing routine operations and building maintenance. Operation & maintenance include regular and preventive maintenance of buildings and their basic systems or utilities, mechanical systems, grounds, and infrastructure. This indicator represents the level of funding provided to meet the stewardship responsibility of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditure to current replacement value (CRV) obtained from the facility audit.

CRV Index = Annual facility Maintenance operating expenditures / Current

Replacement Value
CRV Index = Dhs 5,257,236/Dhs 549,397,795.6
CRV Index = 0.01

The institution CRV Index of 0.01 represents an amount of $1 was spent on maintenance operations for $100 CRV (Current Replacement Value). The CRV index for the year 2002 in US universities averaged between 1.75 to 2% for private funded universities, and 1.6 to 1.8% for public funded universities.
This value shows that we have very economical maintenance practices, or it can also be due to newness of the infrastructure of this university.
Facility Operating GSF Index: This indicator represents the level of funding provided for stewardship of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditures to the institution's gross square feet (GSF).

GSF Index = Annual Maintenance Operating Expenditure / Gross Square Feet
GSF Index = Dhs 5,257,236 ÷ 3,235,427 Sq ft
GSF Index = Dhs 1.62
GSF Index (Dollars) = $ 0.44

The value represents a spending of Dhs1.62 or $ 0.44 per square foot on facilities maintenance. In comparison the APPA facilities operating expenditures in US generally range between $ 3.00 and $ 4.00 per GSF. The outlier values are $ 6.06/GSF for K-12, associates at $ 4.36/GSF and the 0-999 enrolment range at $ 5.09. The institution GSF value is very good as compared to the US counterparts; the reasons for low maintenance cost can be due to availability of comparatively cheap labor and other regional factors.
Facility Operating GIE Index: This indicator represents the level of funding provided for the stewardship of the institution's educational and general capital assets. The indicator is expressed as a ratio of annual facility maintenance operating expenditure to the institution's gross institutional expenditures (GIEs).

GIE Index = Annual Facility Maintenance Operating Expenditures (Dhs) / Gross Institutional Expenditures (GIE)
GIE Index = Dhs 5,257,236.00 ÷ Dhs 179,362,048.00
GIE Index = 0.03

The figure represents 3% of the total institution budget was expended on facilities maintenance. In comparison the facilities annual expenditures in APPA regions generally average between 4% and 8% of gross institutional expenditure. One reason for low GIE is due to the fact that the new construction is not accounted for in the institution budget, and all new construction is carried out by the Public Works Department.

Capital Renewal Index: The capital renewal Index evaluates the level of funding effectiveness for identified capital renewal, renovation and modernization needs. The capital renewal consists of expenditures that are required to keep the physical plant in reliable operating condition for its present use. These expenditures are over and above normal maintenance for items with a life cycle of one year and are not normally contained in an annual facility operating budget. Renovation, modernization, and adaptation involve addition or expansion of facilities to change the interior alignment of space or physical characteristics of an existing facility so that it can be used more effectively, be adapted for new use, or comply with existing codes. The CRV indicator shows the institution's level of funding effectiveness in addressing its identified capital renewal and renovation/modernization needs

Capital Renewal Index = Annual Capital Renewal and Renovation / modernization expenditure / Current Replacement Value (Dhs)

Capital Renewal Index = Dhs 2,069,806.00 / Dhs 549,397,795.60
Capital Renewal Index = 0.0038
This Capital Renewal Index value represents 0.38 percent of Current Replacement Value (CRV) was spent for capital renewal/deferred maintenance operations. The average CRV Index for APPA member institutions ranges "between" 1 percent to 2 percent of the Current Replacement Value. The index evaluates the level of funding effectiveness for identified capital renewal, renovation and modernization needs. One of the reasons for this value to be low, comparing to US counterparts is that the major renovation cost i.e. Student Center, Food Courts etc, are done by the Public Works Department and these costs are not accounted in University expenses, if these expenses are taken into consideration it will match the US expenditures, also it can be show the strong relationship between the students enrolled & CRV Index.
Facilities Condition Index: The facilities Condition Index (FCI) is a comparative indicator of the relative condition of facilities. The FCI is expressed as a ratio of the cost of remedying maintenance deficiencies to the current replacement value. The FCI provides the facilities professionals with a method of measurement to determine the relative condition of a single building, a group of buildings a corresponding rule of thumb for the annual reinvestment rate (funding percentage) to prevent further accumulation of deferred maintenance deficiencies. Deferred maintenance is work that has been deferred on a planned or unplanned basis to a future budget cycle or postponed until funds become available. The term does not include projected maintenance and replacements or such other types of work such as program improvements or new construction. Table 2 presemts the condition of the 28 buildings covered in this research.
Facility Condition Index = Deferred Maintenance Deficiencies (Dhs) / Current Replacement Value Facility Condition Index = 6,923,243.00/549,397,795.00
Facility Condition Index = 0.0126

Facility Name	Deficiencies EL	Deficiencies Mechanical	CV	CRV/ Sq ft	GSF	CRV	Cost of Deficiencies	FCI
Student Center Building	15,901.00	10,000.00	119,760.00	250	30,106	7526500	145,661.00	0.019353
Chemistry Building	9,036.00	8,000.00	73,710.00	250	39,342	9835500	90,746.00	0.009226
New Academic Building	9,629.00	3,000.00	16,032.00	250	64,390	16097500	28,661.00	0.00178
Arch. & Design Building # 1	1,917.00	6,000.00	260.00	250	51,538	12884500	8,177.00	0.000635
Arch. & Design Building # 2	7,129.00	4,000.00	42,510.00	250	69,320	17330000	53,639.00	0.003095
Eng. Building Left.	7,129.00	15,000.00	10,863.00	250	80,708	20177000	32,992.00	0.001635
Eng. Building Right.	7,129.00	15,000.00	12,013.00	250	81,892	20473000	34,142.00	0.001668
Language Building	1,617.00	7,500.00	865.00	250	48,373	12093250	9,982.00	0.000825
Main Building	15,512.00	200,000.00	1,031,709.00	280	284,966	79790480	1,247,221.00	0.015631
Physics Building	1,617.00	8,000.00	850.00	250	42,303	10575750	10,467.00	0.00099
Business Building	1,617.00	10,000.00	49,265.00	250	46,231	11557750	60,882.00	0.005268
Sports Complex	7,129.00	18,000.00	72,875.00	250	71,311	17827750	98,004.00	0.005497
Mosque	100.00	2,000.00	2,600.00	280	8,622	2414160	4,700.00	0.001947
Male Dorm A-B	2,000.00	5,000.00	39,000.00	220	71,128	15648160	46,000.00	0.00294
Male Dorm C-D	2,000.00	5,000.00	135,250.00	220	50,806	11177320	142,250.00	0.012727
Male Dorm E-F	2,000.00	5,000.00	70,250.00	220	29,331	6452820	77,250.00	0.011972
Male Dorm G-H	2,000.00	3,000.00	70,250.00	220	12,421	2732620	75,250.00	0.027538

Male Dorm I-J	2,000.00	5,000.00	104,000.00	220	71,128	15648160	111,000.00	0.007093
Male Dorm K-L	2,000.00	3,000.00	70,250.00	220	124,216	27327520	75,250.00	0.002754
Male Dorm M-N	2,000.00	0.00	39,000.00	220	57,846	12726120	41,000.00	0.003222
Female Dorm A-B	2,000.00	2,000.00	139,000.00	220	123,495	27168900	143,000.00	0.005263
Female Dorm C-D	2,000.00	2,000.00	139,000.00	220	93,808	20637760	143,000.00	0.006929
Female Dorm EF	2,000.00	1,000.00	39,000.00	220	123312	27128640	42,000.00	0.001548
1 Bedroom Housing	20,000.00	15,000.00	15,000.00	220	61,839	13604580	50,000.00	0.003675
2 Bedroom Housing	30,000.00	20,000.00	15,000.00	220	174,699	38433780	65,000.00	0.001691
3 Bedroom Housing	30,000.00	30,000.00	15,000.00	220	218,875	48152500	75,000.00	0.001558
Vc Residence	4,000.00	9,000.00	15,000.00	240	8,826	2118240	28,000.00	0.013219
Granite Area			3,951,969.00	70	564,567	39519695.6	3,951,969.00	0.1
Chancellor Residence	5,000.00	12,000.00	15,000.00	240	9,741	2337840	32,000.00	0.013688
TOTAL	**194,462.00**	**423,500.00**	**6,305,281.00**		**2,715,140**	**549397795.6**	**6,923,243.00**	**0.01260**

Table 2 Calculation of Facility Condition Index of each building

The Average Facility Condition Index (FCI) for the entire institution is 0.0126, this represents that 1.26 percent of the Current Replacement Value is required to maintain the institution facilities in good condition. APPA has some variability in FCI statistics. It ranges from 0 percent for an institution that opened one year ago up to 50 percent for 45-50 year old Institution. Considering the newness of the institution (average age is 6.5 years) this value is still high, there are a number of reasons, for example the speed of construction of some buildings and poor inspections.

Table 2 shows all the buildings are within the range (<0.05 - <0.10) which is Termed as Good condition except, the Granite Area which has a FCI = 0.1 is in Poor condition and require urgent Repairs/Replacement.

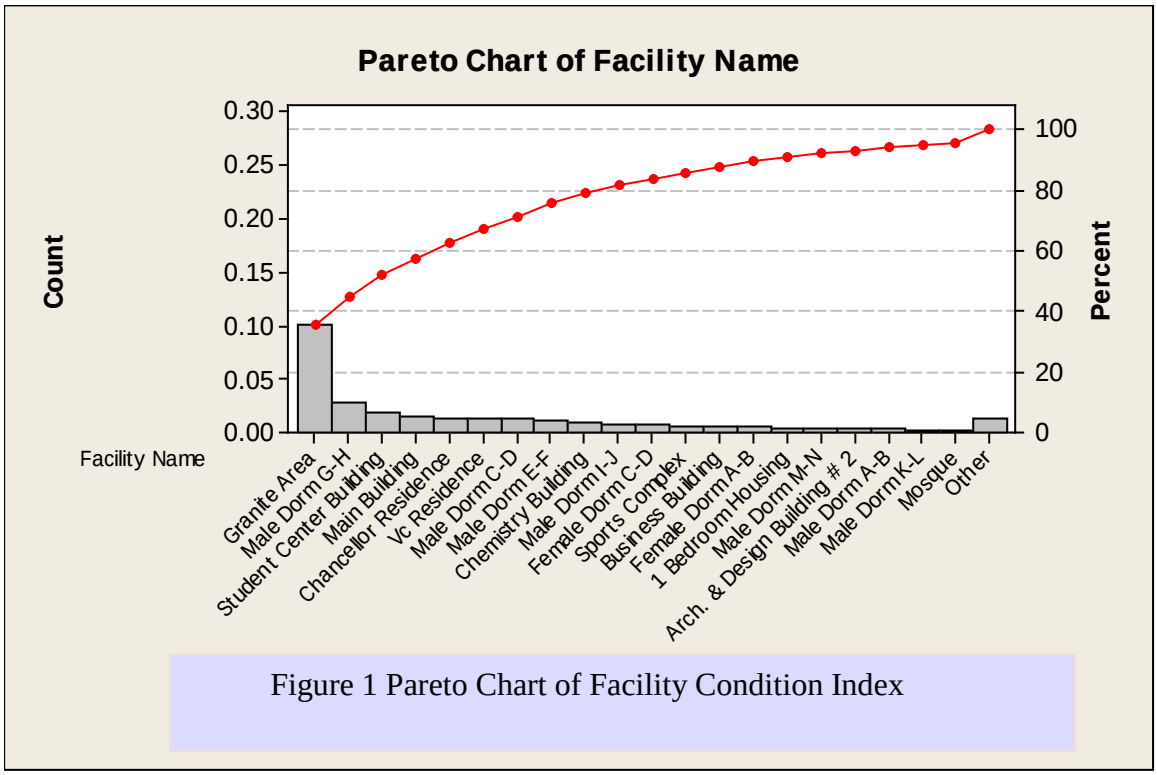

Figure 1 Pareto Chart of Facility Condition Index

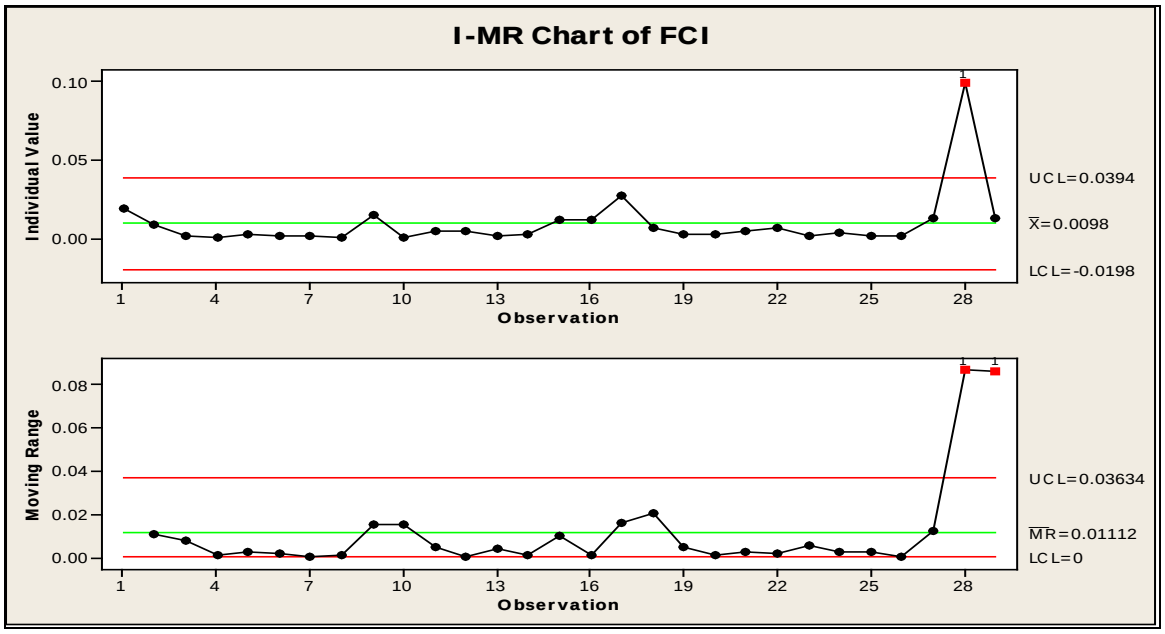

Figure 2 Quality Control Chart of FCI

The IR chart Figure 2 shows that the granite area is out of control, figure 1 suggests that the overall FCI can be improved by 35 percent, by repairing/replacing granite. All other facilities FCI is below 0.05 which is termed as Good Condition and don't require immediate attention, however a priority based phased renovation plane is required to prevent further deterioration of other facilities. The FCI gives the actual requirements for facilities to be in good condition & CRV represent the actual spending by the institution. The difference shows the GAP between the requirements & actual spending as shown in Figure 3.

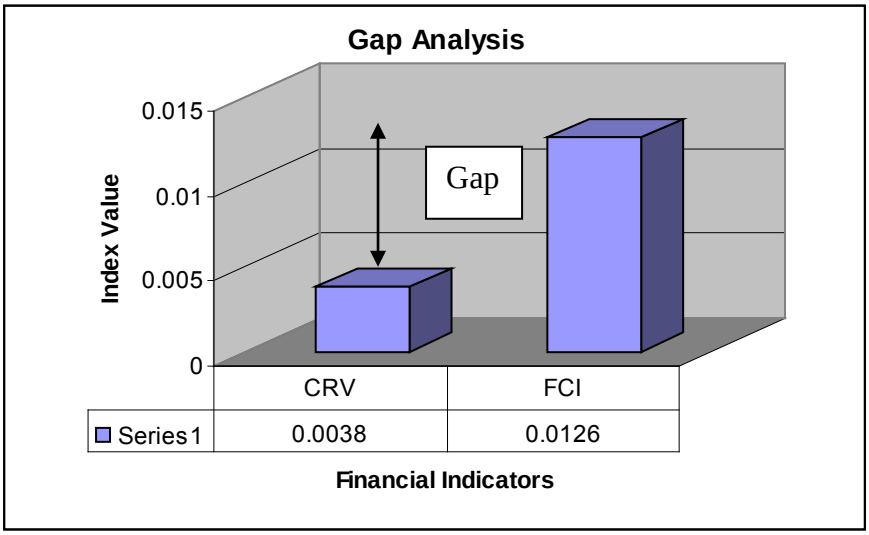

Figure 3 Comparative graph of key Financial Indicator

GAP = FCI – CRV
GAP = 0.0126 – 0.0038
GAP = 0.0088
The GAP in Dirhams is equal to 4,834,700.60 Dhs in maintenance backlog; in terms of dollars it is equal to $1,313,777.33. The result is consistent with work of Rush &

Johnson, 1988 and Trasfield and Akhlagi, 1995. It indicated that performance measures for facilities are related to the main business indicators.

4 Conclusions

The Capital Renewal Index value represents 0.38 percent of Current Replacement Value (CRV) was spent for capital renewal/deferred maintenance operations. The average CRV Index for APPA member institutions ranges "between" 1 percent to 2 percent of the Current Replacement Value. The index evaluates the level of funding effectiveness for identified capital renewal, renovation and modernization needs. One reason for this value to be low, comparing to US counterparts is that the major renovation cost i.e. Student Center, Food Courts etc, are done by the Public Works Department and these costs are not accounted in University expenses, if these expenses are taken into consideration it will match the US expenditures, also it can be show the strong relationship between the students enrolled & CRV Index.

The Average Facility Condition Index (FCI) for the entire institution is 0.0126, this represents that 1.26 percent of the Current Replacement Value is required to maintain the institution facilities in good condition. For APPA member institutions there is a lot of variability in FCI statistics. It ranges from 0 percent for a institution that opened one year ago up to 50 percent for 45-50 year old institution. Considering the newness of the institution (average age is 6.5 years) this value is still high, there are a number of reasons, for example the speed of construction of some buildings and poor inspections.

Building systems and infrastructure are maintained and operated at a level of reliability that contributes to the successful implementation of the institution's mission and programs. Numerous building systems have been upgraded over the past 8 years with the aggressive deferred/renovation/modernization program. However the bulk of institution building systems continue to age as is evident from the increasing gap between the budgeted deferred maintenance and the actual requirements, of these the most prominent is the HVAC system, there are no provisions for refurbishing these fast aging systems. Building system are presently operated at 0.01 Percent of building CRV, this has to be increased progressively to 0.012% of CRV to avoid critical systems failures, funding processes must be identified to fund both the operating and maintenance budget, and the budget for major replacement and renovation of building systems.

5 Recommendations

From the capital renewal index only 0.003% was spent as against the required 0.012%, leaving further accumulation of deferred maintenance backlog of 0.012 – 0.01 = 0.002 % of the current replacement value, which is equal to Dirham's 1,098,795.59 or in dollars it is equal to $ 298,585.75 over and above the budgeted differed maintenance, this has to be addressed to avoid deterioration of the buildings, the most urgent requirement is to address the granite area whose facility condition index was found to be poor.

It is obvious that the institution has emphasized and embraced the importance of maintaining attractive landscaping, green spaces, trees, lighting and other amenities. Though these services are maintained by the local municipality, a system of better communication & response has to be created to increase fast responses from these departments.

The other area of concern is the roads inside the Institution, though the roads are in good shape there is no provision for flooding from rain, the public works have to be approached to provide adequate draining system.

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Strategic asset management and master planning within the healthcare sector: Exploring the theoretical need for evidence based change management in strategic planning

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Abstract:
The delivery of health and social care in the UK is undergoing profound change and being redesigned to provide high quality, person-centred services and improved capacity and performance. This is taking place in a context of: change in asset ownership; moves towards increased local autonomy in the provision of services; and the introduction of national, evidence-based standards and inspection. There has been considerable activity surrounding the planning, design and operation of healthcare services and facilities, however, Strategic Asset Management as a field of literature has not sufficiently developed in line with this change in emphasis. The recent move towards PFI, LIFT and World Class Commissioning within the NHS (National Health Service), has meant that roles and responsibilities for estates are shifting alongside commissioning competencies; however, the impact of this shift on the built healing environment is not well understood. Strategic Asset Management on a regional scale requires: reliable predictive data; effective tools and processes for developing and modelling future scenarios; and people with the appropriate skills and expertise, although these are not always available. As such, these factors need to be better understood and the stakeholders responsible for them defined.

Keywords: Asset Management, Healthcare, Strategic Planning

1 Introduction

The current rapid change environment within the NHS will provide a rich source of practical research and knowledge and learning; which if captured should enable the development of a more strategic, long-term community focussed approaches and help various agencies integrate their planning processes of healthcare infrastructure and service delivery. The aim of this study to is explore the master planning techniques that could facilitate strategic asset management and service reconfiguration of primary care trusts. There is a need to ensure that existing Strategic Estates Management tools can be used to plan integrated and contestable systems. Contestability and choice are essential in pushing public services towards an understanding of their customers to deliver better quality and reduced cost (Caldwell and Roehrich, 2008, Strobl and Bruce, 2000). In the last few years, there has been series of policies and initiatives to promote value for money during the procurement of construction projects for the public sector clients across diverse sectors, including healthcare. These have largely

been driven by the increasing recognition of the greater benefits that can be achieved from the procurement process. While the initial focus has been on the optimisation of costs associated with the design, construction, operation and decommissioning of infrastructure projects (whole-life costs), there is now a shift towards the consideration of the needs and requirements of a broader range of stakeholders and encompassing wider economic, social and environmental issues related to the management of assets. However, there have been difficulties related to a real understanding of the whole-life value concept and the dearth of suitable assessment tools, methods and techniques to assist clients in making these evaluations at the various stages of infrastructure procurement (Bourke et al., 2005, Mootanah, 2005). This paper defines the principles of Strategic Asset Management and Planning, before investigating more specifically the tools that can help to deliver this change.

2 Changes in Healthcare Planning Policy, Strategic Asset Management and Master Planning

The reforms of the past 10 years have clearly moved the NHS forward, and the national and regional plans under the *Next Stage Review* set striving goals for the future. Lord Darzi in his NHS *Next Stage Review Interim Report 'Our NHS Our Future'* (Darzi, 2007, Darzi, 2008) suggests, the development of a more strategic, long-term and community focused approach to commissioning services, where commissioners and health and care professionals work together to deliver improved local health outcomes. Carvel (2008) stated in his article in The Guardian: 'NHS hospitals will be eligible for bonuses worth billions of pounds if they can demonstrate top quality clinical performance and hospitals would be required to publish "quality accounts" alongside the financial balance sheet.' The focus on prevention, improved quality and innovation will support the NHS in its drive to ensure the best possible value for taxpayers' money. Although Carvel (2008) also stated that 'the report set no new national targets and included no master plan for the reorganisation of services'. Stanton (2007) also presents the other key developments within the NHS: World Class Commissioning, Practise Based Commissioning, and Commissioning for Health and Well-Being. All these aim to deliver a more strategic and long-term approach to commissioning services, with a clear focus on delivering improved health outcomes.

Tannis et al. (2005) supported the view that healthcare facilities that were considered as state of the art 20 or 10 years ago are fast becoming functionally obsolete based on the exponential changes in clinical services and operational trends and new technologies. They further stated that 'the challenge to all involved in the planning, construction and management of healthcare facilities is to anticipate, to the greatest degree, where changes are most likely to happen and to consider flexibility throughout all stages of the planning, design, construction and post occupancy phases'. The main challenge within planning construction and management of healthcare facilities is to anticipate the areas where change is likely to occur and consider flexibility throughout all the stages of planning designing and construction.

There is a fundamental shift in the way the NHS functions, from a hospital driven service to one that is more community based with a greater integration of various services. Shifting the balance of care has significant implications on the management

of estates; hence it is important that the board has a clear understanding of the current asset base, including size, location and condition for future planning. National Audit Office (2007) note, 'public service providers are expected to demonstrate to their communities that they are delivering better value for money addressing not only efficiency but also effectiveness in delivery'. In order to achieve this, the boards must be aware of the performance of their assets.

2.1 Justification

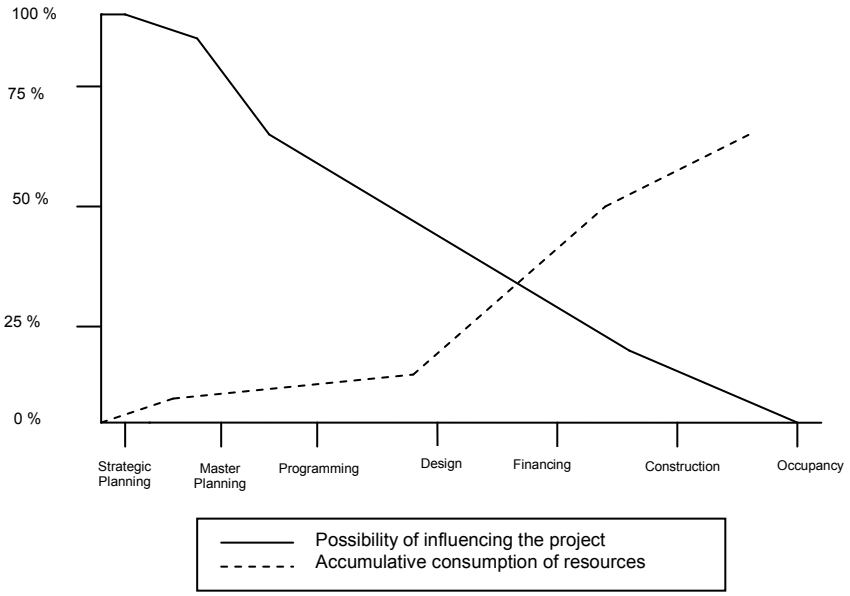

Figure 1: Conceptual diagram of resource consumption, adapted from planning healthcare facilities and managing the development process
Source: (Hosking, 2004))

Figure 1 illustrates the importance of strategic and master planning within healthcare organisations, as it is in this stage that there is the highest possibility of influencing the project with the minimum consumption of resources.

2.2 NHS capability for change & Resulting Benefits

All organisations need to change and develop if they are to remain competitive and satisfy clients' ever increasing expectations. The need to change is usually driven by external factors such as new legislation or increased competition, or internal factors such as the implementation of new technologies (Price and Chahal, 2006). The implementation of change is a complex process and evidence from a number of sources suggest that many organisations within the NHS fall short on the change capability required to deliver the goals set forth by the Lord Darzi's NHS *Next Stage Review*. Bevan et al. (2008) further elaborate in their report a study of change capability in the NHS (2006) conducted by the office of Government of Commerce; the NHS scored at only two out of a possible five for seven out of the nine categories assessed. The NHS received low scores in the use of change management methods. A study of NHS trusts and PCTs by the University of Warwick (2006) looked for evidence of the kind of improvement approaches that have been used in industry for

more than 50 years to improve operational efficiency and effectiveness. They found very limited capability in evidence based change management amongst majority of NHS organisations that are in the middle of the performance curve.
The NHS is a complex adaptive system and major intervention changes not just aspects of the system but contribute to the very nature of the system itself (Bevan et al., 2008). However, the NHS as a system is inefficient, the numerous components of the system do not work together effectively and NHS organisations on the whole are slow to adopt new technologies and practices. The Darzi review provides an opportunity to rethink not only the organisation of healthcare service delivery, but also the NHS's approach to innovation (Barlow et al., 2008). The main premise motivating this paper is: can the effective use of ICT tools within the master planning process/strategic asset management process enhance the change process? This will be supported by an initial literature review of asset management and master planning, followed by the development a research methodology incorporating the study of the master planning process within a PCT (Primary Care Trust) and the study of the SHAPE tool and its potential to identify future services and asset requirements, based on the top quartile performance.

In order to have a meaningful discussion about master planning and strategic asset management, it is important to define these terms. The following sections entail a discussion around asset management, strategic asset management, master planning and planning.

3 Asset Management and Strategic Asset Management

Asset Management is a broad term. It can be defined as a process that guides the gaining of assets, along with their use and disposal in order to make the most of the assets and their potential throughout their life. Assets could refer to financial and personal assets or physical and public assets. Assets can be generically categorised as financial assets and non-financial assets. For the purpose of this research when we refer to assets, we mean tangible fixed assets (non-financial) such as infrastructure. This classification is based on European System of Accounts (1996). The term Asset Management is referred to in different ways by various organisations. Generally, practitioners tend to define Asset Management in terms of the infrastructure for which they are accountable. It is imperative that the assets are well maintained and have favourable locations that would positively support service delivery and enhance user experience. Benefits would also include:

- improving outcomes for people who use services;
- provision of safe, secure and appropriate buildings that support service requirements;
- means of identifying and disposing of surplus or poorly used assets;
- to achieve value for money in the costs associated with holding, managing and disposing of the NHS estate; and
- clear evidence of estate performance.
  (Audit Scotland, 2008)

The effective planning and management of healthcare assets is essential to the provision of safe, secure, high quality services capable of supporting current and

future service needs. Asset Management must take place at a number of different levels: starting at the strategic level and then moving towards a more operational level. The following Asset Management process is adapted based on a description in the 'Audit Scotland, 2008 report'.

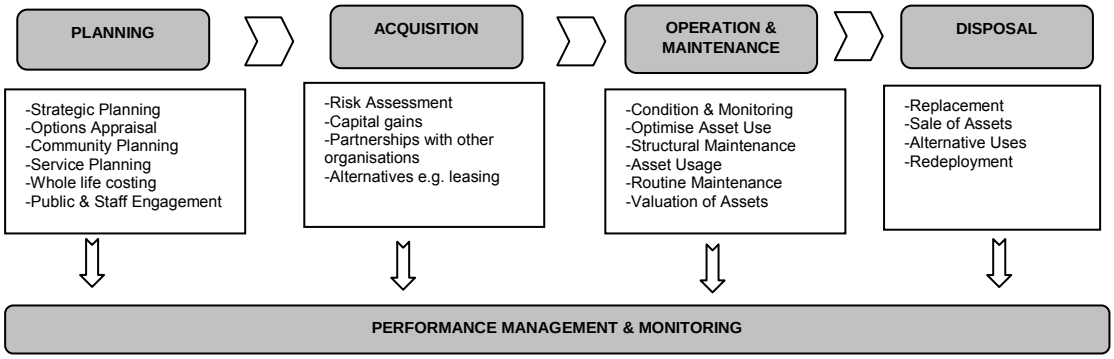

Figure 2: Asset Management Process, based on 'Audit Scotland Report, 2008'

The above diagram depicts the key elements namely, planning, acquisition, operation and maintenance, performance management and monitoring of the Asset Management process. There are a large number of issues to be considered within each of these elements. Ruparel (2001) further adds that the procurement of new assets is only one phase in the asset management cycle and so the preparation of a Strategic Asset Management plan for new and existing assets is to be considered, including development plans, disposal plans, investment plans and maintenance plans in order to provide safe, functional and efficient assets. Such strategic plans are intended to ensure that the overall costs of prevailing assets owned, is lowered, the level of assets held by trusts do not exceed its service delivery needs and that the service potential of existing assets is maximised, and the demand for assets/facilities is reduced by promulgating effective use of alternative solutions.

Traditionally, Asset Management is only related to managing the current assets of an organisation but in order to ensure the long-term viability of the organisation it is imperative to consider the continual improvement of this process along with the strategic direction of the organisation. This is where the overarching term of *Strategic Asset Management* is introduced, which includes elements of Asset Management tied into the strategic objectives of the organisation. Various definitions of Strategic Asset Management are proposed by building, utility, healthcare and other infrastructure organisations. Each of these organisations develops a strategic asset management plan based on the organisational needs and drivers. Maheshwari (2006) defined Strategic Asset Management as: "a process of developing, creating, maintaining and disposing assets through a complex series of interlinked well-defined processes that are continually improved, over the life cycle of an organisation, with an aim of achieving the objectives of the organisation". Strategic Asset Management can also be defined as the planned alignment of physical assets with product or service demand. It is achieved by the systematic management of all decision-making processes taken throughout the life of the physical asset (Griffith University, 2005, Knowledge Group Consulting, 2006). The real indicator of the success of Strategic Asset Management is enhanced product or service delivery.

3.1 The Planning Process

The initial planning phase undertaken towards the realisation of a physical hospital plan is often referred to as master programming/planning. This establishes the framework for addressing the health program's potential site and facility needs over a specified period of time. Issel (2004) adds that the focus should not be on strategic planning rather on tactical planning which is a set of planning activities done to implement a broader global strategy. He describes it as a cyclic activity rather than a linear process with recursive events requiring additional or refreshed courses of action for the health program. The following diagram represents this planning and evaluation cycle. The indirect trigger for planning could be the information generated from an evaluation that reveals either the failure or success of a health program or the need for additional programs.

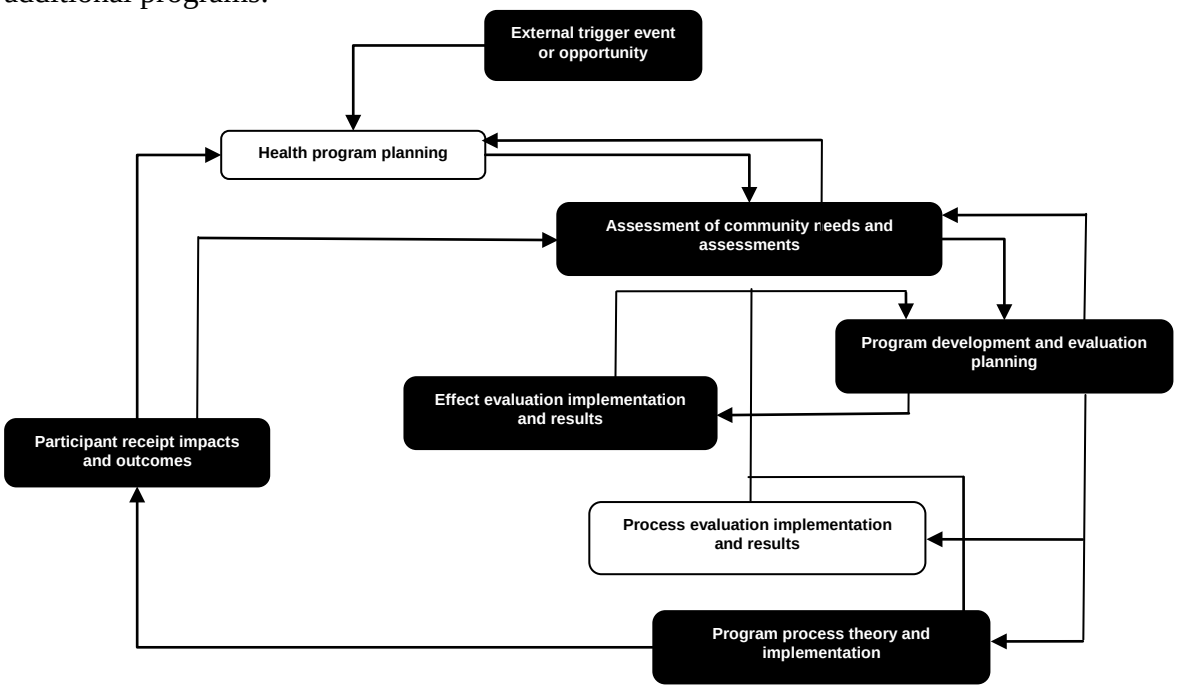

Figure 3: The Planning and Evaluation Cycle
(Adapted from: Issel, 2004 *Health Program Planning and Evaluation: A practical, systematic approach for community health*.)

Figure 3 can be adopted to gain a better understanding of the current scenario within the NHS. The external trigger is the changing policies and environment within NHS. The participants in this case are the community that is impacted by the various service reconfigurations of the hospital facilities within that particular region. This study focuses around the health program planning and process evaluation and implementation; which is the Strategic Asset Management and Master Planning process. It can be inferred from the above diagram that this process is highly iterative and interdependent on various activities such as planning considerations and capabilities. Planning is the key element of the Strategic Asset Management process. Based on an initial review, it was identified that various authors refer to planning, master planning and facility planning as interchangeable terms. Issel (2004) defined planning within health programs as: 'the set of key activities in which the key individuals define a set of desired improvements, develop a strategy to achieve those desired improvements and establish a means to measure the attainment of those

desired improvements'. Dr Kevin Woods Director General Health, Chief Executive NHS Scotland defined master planning as "the act of managing and making the most of change; of understanding how the context of a large, complex site will develop over time; of considering potential and realising best value from investment" (Hoskins, 2004). It establishes a shared vision of the future; a flexible framework that guides individual developments and promotes a sense of place. Wolper (2004) further states that facility planning is the planning, designing and building of the physical facility. Generically, the planning process can be applied to all types of healthcare facilities. Various approaches can be adopted, these are elaborated below.

Table 1: Various Approaches to Planning
(Issel, 2004. *Health Program Planning and Evaluation: A practical, systematic approach for community health*.)

Incremental approach	Apolitical Approach	Advocacy Approach	Communicative Action Approach	Comprehensive Rational Approach	Strategic Planning Approach
It addresses the immediate concerns and hopes that disconnected plans and actions have a cumulative effect on the problem. This is helpful when the resources are limited and this method can lead to small gains in immediate problems. The major disadvantage is that small planning efforts may lead to conflicting plans and confusing or non -integrated programs.	This is a problem solving approach which relies solely on technical knowledge to arrive on a solution and assumes that technical knowledge makes it possible to achieve compromises among those involved in the health problem and the planning process. It is implicitly the gold standard for planning. Forester (1993) criticises this approach as it does not account for interpersonal dynamics and neglects cultural issues involving the potential program participants and staff.	The planning is client focussed and includes mandated citizen participation in the planning activities. It is a bottom up form of comprehensive rational planning. Planners would speak on behalf of those with the health problem. The advantages of this approach are most evident is situations in which the clients or citizens are not empowered to convey their own preferences or concerns. The disadvantages are that the clients or citizens may not agree with the opinions or views of the advocate. This approach implicitly entails some degree of conflict which may have negative repercussions in the long term.	It is concerned with the distribution of power and communication. Those involved in planning make efforts to empower those with the problem through communication and sharing of information. This approach is predicated on making those with the problem equals in the planning process. A major advantage in this method is that members of the target audience gain skill knowledge and confidence in addressing their own problems. However the planner involved needs to have a different set of skills from those needed to do rational or incremental planning.	This is fundamentally a systems approach involving problem analyses by drawing upon ideas from the systems theory-namely feedback loops, input and output, systems and subsystems. It assumes that factors affecting the problem are known and virtually all contingencies can be anticipated. It is comprehensive in the sense that planners can take into account those contingencies and peripheral influences. The planners set goals, identify alternatives, implement programs and monitor results. One advantage of this method is that it facilitates obtaining information from stakeholders who may otherwise be reluctant to share information because it diffuses power from an authority base to information base. This approach yields more information for decision making and allows planners to face issues faced by the entire system.	This focuses on the organisation and its ability to accomplish its mission in a fiscally responsible manner. It is particularly applicable to the infrastructure level. The resources needed for addressing the health problems are identified through strategic planning and are considered in terms of mission of the organisation. This approach is advantageous as it takes into account the context weather competition or policy as well as having a long term focus. Despite having the capability to quantify the decision making process, knowing the best option does not always guarantee the best decision or program plan. One of the disadvantages could be the lack of flexibility to respond to new environmental opportunities or threats.

Key factors that need to be taken into account within service and facility planning are the population growth and the changing demographics. The ongoing challenge in the UK is to continue to reconfigure services to match changing population and services needs and to provide an asset base which maximises this responsiveness. Given the current environment within the NHS, it would be interesting to identify which of the above approaches could be utilised and would be suitable for a planning process within a primary care trust.

4 Capabilities and Considerations for Strategic Asset Management and Master Planning Change

Effective planning activities require a wide range of competencies and capabilities which will be required at different points within the planning process. Goldman (2002) suggested the following areas for consideration.

- Data sources and resources
- Primary research tools and techniques
- Healthcare industry structure
- Healthcare programs and services
- Buyer and consumer behaviour
- Local/regional market conditions
- National business and economic trends
- General business acumen

Tannis et al. (2005) described strategic planning programs and services at a high level and suggests detailed information gathering with regards to the site or possible sites (existing or new) for the development of the facility. These investigations include:

- adequacy of site to accommodate anticipated use;
- location relative to the existing population;
- proximity to major highways for emergency vehicle access;
- sufficient size of the facility and real estate to ensure changes, growth, renewal is possible in the future; and
- analysis such as soil testing, topographical analysis, traffic flow patterns, capacity to access municipal services (water, sanitation, power).

Wolper (2004) suggests that planning should take place at a corporate level in organised delivery systems. The physical facility planning process should begin once the strategic plan is established. The two major phases of the facility development process are: planning/designing and implementation/construction. Master site and facility planning includes:

- needs of all delivery sites in the organised delivery system;
- interdepartmental relationships within those sites;
- flow of patients, visitors, staff and supplies throughout the system and within the sites;
- site development, including parking needs and traffic patterns;
- other current and planned facilities on site, such as ambulatory care centre, physicians, parking structure and speciality centres;
- a functional and engineering evaluation of the immediate and long range value of each structure;
- property acquisition and disposal;
- vertical and horizontal transportation systems; and
- future expansion of services and programs.

A dynamic Strategic Asset Management plan will encompass planning the reconfiguration of facilities to meet the current and future health needs and enable informed decision making based on a collection of consistent base data set. It is up to the management to organise planning, provide analytical support and coordinate

planning efforts throughout the organisation. In order for planning to be effective as an organisational management tool, Goldman (2002) suggested that the following activities to be performed.

1) ***Conduct environmental scans and forecasts***- to provide information regarding the demographic, social, economic, technological and political trends, competitor initiatives and market structure and direction.
2) ***Educate key participants in planning techniques***-to ensure that individuals involved in the planning process have clear expectations as to the purpose, order and expected outcomes of each activity.
3) ***Design and administer a planning process***- to organise activities to take place and function as a co-ordinating mechanism for business line and operating unit plans
4) ***Develop policies and procedures to support the planning activities***- to ensure that consistent standards and approaches are used across the organisation for all the planning activities.
5) ***Reconcile planning outcomes with other key organisational processes such as budgeting and recruitment***- to ensure effective management of resources
6) ***Monitor and evaluate plans***- to provide an impact on the initiatives
7) ***Plan for planning***- to ensure adequate resources for planning are retained and developed.

The above planning considerations and capabilities can be mapped against the actual process that takes place within a primary care trust. Other considerations that would be required to be taken into account include costs of repairs to existing facilities, provision of care closer to home, investment required to upgrade sites, investment decisions based on clinical quality, local need, health inequalities, risk, local health and priority access. There are a number of barriers to moving resources, including the significant amount of resources tied up in secondary care and the need to maintain hospital services during periods of change. Shifting the balance of care has significant implications on the planning process for example; reconfiguring services may imply additional combined use of facilities with other public bodies as services move into the community. The NHS faces considerable challenges in progressing these changes. Can ICT tools assist in the planning process and aid in dealing with change? The following section discusses this issue further.

5 Innovation within the NHS

The NHS's performance in taking up and spreading innovations and existing best practice is variable (Barlow et al., 2008). According to Barlow the key challenges include 'NHS organisations' capacity and receptiveness for innovation, the lack of long-term strategic thinking, fragmentation between healthcare organisations, professional and cultural silos and the funding system'. In order to reduce costs and increase the potential advantages it is imperative that evidence-informed design goals and approaches be included early in the process of facility programming and design (Ulrich, 2000). Evidence based planning with supportive ICT tools can affect the internal configuration and overall design of the facility. The 2007 Comprehensive Spending Review (CSR) linked variations in NHS productivity to variable practice and technology uptake. It stated that "reducing such unnecessary variation could

potentially generate net cash savings of £1.5 billion per year by 2010-11" (Barlow et al., 2008).

Simulation and modelling tools are being used to develop virtual health systems which would enable a planner to test new models of care in a hypothetical context. Such tools can also evaluate the potential impact of changes in population, demand and burden of disease (Sellers and Hankey, 2008). These tools also help illustrate the impact of service changes on the available options or models of care. There are a number of off the shelf simulation packages, which have been used by parts of the NHS to test future service changes, model the impact of disease outbreaks or to forecast the impact of population growth, e.g. SIMUL8. GoldSim, Powerism and Scenario Generator (NHS Institute of Innovation and Improvement, 2008). Another such tool called 'SHAPE' was developed by the Department of Health and will be studied as a part of this research. The adoption of innovations in ICT is underpinned by a vast literature on technology transfer which is beyond the scope of this paper, but could be the subject of further research.

5.1 SHAPE

SHAPE is a NHS web based benchmarking software. SHAPE stands for 'Strategic Health Assets and Performance Evaluation'; it allows providers and commissioners to compare costs and activity by condition, to look at length of stay, day surgery and outpatient rates. The software can be used to identify future services and asset requirements. The system is also linked to a geographical information system, allowing comparison between the various demographic trends of the local population. It can be used to test whether different service configurations could be improved performance. The software is pre-loaded with five years of Health Episodes Statistics data (HES), 2001 census demographics and estates information for 99 per cent of health and social care estates, including GP practices and private hospitals (DOH, 2004). SHAPE uses the latest ClearNET data to produce preset reports. These reports show comparative performance against the top ten high impact changes and other performance indicators which enables identification of areas for potential improvement. In addition, there is a module that assesses bed, theatre and clinical equipment and space necessary to meet demand. The strategic analysis component calculates the cost benefit of a health system running at optimal capacity and productivity.

6 Research Methodology

This section entails the methodology adopted for conducting this research along with suitable data collection techniques employed, giving due consideration to the scope of this research project. A qualitative paradigm is selected for this research as the data collected will chiefly be non-numeric. A case study of a PCT (Primary Care Trust) would be undertaken in order to investigate the intuitive multi agency and multi stream approach to Master Planning/Strategic Asset Management. This will be supported by interviews of key individuals involved in the process, to validate the actual process taking place within the PCT. This will be followed by a desk study of the SHAPE tool to understand the capabilities and application of it. The final piece of

this research would be to validate and trail the SHAPE tool against a real life service and estates reconfiguration.

7 Conclusion and Further Research

The challenges in today's healthcare environment have placed pressure on PCTs to develop better planning systems. The structure of healthcare delivery is changing and PCTs are now adopting an integrated/service reconfiguration approach. Although traditional forms of planning focus on internal factors of administration there is a growing need to incorporate other sophisticated systems to support the planning process. As part of this research a comprehensive information flow model of this process is being developed to help planners manage the complexity and understand and optimise the iterative design process. What this depicts is that Master Planning and Strategic Asset Management are closely interlinked and that multiple stakeholders from different organisations and agencies must work cooperatively in the strategic and tactical decision making. This model will also depict that various infrastructure decisions will be driven by different planning evidence gathered by numerous activities and stakeholders in what is a very complex and interrelated system, process mapping is a tool that has been identified as a key tool in understanding and driving system improvement.

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Positioning of Black and Asian construction businesses in the UK: a literature review

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Abstract:
The Construction Industry is an important contributor to the United Kingdom (UK) economy, having 95% of Small and Medium-sized Businesses (SMEs) within its industry. However, there is a very small sub-group which consists of Black and Asian Construction Businesses (BACBs) and Minority Ethnic Construction Women and Disabled Persons (MECWDs) that represent 12.6% of the Construction Industry in England (SBS 2006), who have not yet been extensively researched, nor have their economic contribution to the UK economy been accurately documented. This study is part of an in-depth research aimed at investigating the survival and growth of BACBs within the UK. The aim of this paper is to establish the positioning of BACBs. A literature review of scholarly material published in the last ten years would be carried out focusing on three main facets of BACBs. First, the main characteristics of the UK Construction Industry are established. This is followed by a critical review of the support that is available for the survival and growth of BACBs. Third, it discusses the solutions that have been offered for BACBs that would assist them in their survival and growth.

Keywords:
Construction Industry, SMEs, Black and Asian Construction Businesses (BACBs), business survival and growth

1 Introduction

A significant number of Black and Asian Construction Businesses (BACBs) are SMEs. SMEs are defined as businesses which have less than 250 employees and whose business turnover is limited to fifty million euros. Their significant contribution of £2.9 billion (59% output) to the Construction Industry (SBS 2006) make them very important. However, due to the Industry's competitive, fragmented and complex nature (McCabe 2006) some of these important businesses are fraught with problems of survival and growth because of their small size and limited resources.

A considerable amount of research has been carried out on SMEs over the last decade, indicating that they face many challenges ranging from lack of competitiveness to lack of appropriate skills. However, these problems still persist. Some of the research that has been carried out has been on marketing and networking (Siu and Kirby, 1998); business growth (Packham *et al.*, 2005; Dobbs and Hamilton, 2007); competitiveness and survival (Brooksbank *et al.*, 2004), and entrepreneurship (Glancey, 1998; Robertson et al, 2003). Various solutions have been suggested to address some of these challenges faced by construction SMEs. Research by Weston (1996) who recommended strategic planning; Meldrum and Berraranger (1999) concluded that Higher Education could meet some of the shortcomings of these groups; Boyd and Xiao (2006) recommended providing knowledge based workshops for these enterprises in order to alleviate their operational costs and management problems. Perez-Aroas et al (2007) designed a knowledge management tool for improving sharing their knowledge amongst themselves; and Sexton et al (2007) used a conceptual model to identify two types of knowledge-based innovation that would help these groups. However, the fact remains that due to their size and limited resources the inherent problems of Construction SMEs still continue with the main areas of concern that impact on their survival and growth being that of the *economy, regulations, competition, cash flow and taxation* (SBS 2006).

The opposite scenario exists with research on Ethnic Minority Businesses, EMBs even though a considerable number of them are SMEs. Ethnic Minority Businesses are defined as businesses containing, Black, Asian, Chinese and any non-White and minority White group such as Turkish, Eastern European and Jewish. Only sparse research has been carried out as compared to non-EMBs. A few have been Altinay and Altinay (2008); Nwankwo (2005); Smallbone *et al.* 2005); Chaudhry and Crick (2000, 2003) and Barrett *et al.* (2002). However, they focused on businesses within the Catering, Retail and Manufacturing Industries and Hotel Sectors, and Ram and Smallbone (2001) and Basu and Altinay (2002) discussed the various entrepreneurial concepts within these industries.

Hardly any research has been carried out on BACBs except by three researchers. The first by Clark and Drinkwater's (2006) who used census data to expose a trend of changing patterns in Britain, but it focused on change in unemployment figures of the self-employed, rather than on businesses. It also highlighted the distinctions between the various ethnic groups across all the various sectors, and the percentage and demographic change within these sub-groups. The other two who focused on businesses revealed that BACBs did encounter *barriers*, but there were limitations to these two key research studies by Greater London Authority (2007) and by Steele and Sodhi (2004).
However, the impact that some of these barriers and factors such as *social exclusion (from Old Boy Network)* and *discrimination* have on such small businesses has yet to be better understood and properly assessed due to insufficient knowledge of their ability to grow.

The definition given to BACBs by the LEOF, London Equal Opportunities Federation's is that of a minority led enterprise is that of "a sole trader, a company or business which is owned by a minimum of fifty-one percent by any combination of the groups of Black persons, Women and Persons with disabilities, or a minimum of fifty percent by Person(s) with disabilities only" (Ram *et al*., 2002).

Positioning of BACBs within the Construction Industry may prove difficult as they are a very small group who form less than 12.6% of the Construction Industry in England (SBS 2006). The title indicates that the paper is exploratory in terms of investigating the matters of support and growth that effect BACBs, rather than in providing any empirical answers. BACBs' ability to survive and grow will impact on their positioning within the Construction Industry. It is therefore important that in order to render assistance to this group the factors impacting these areas of survival and growth need to be identified. BACBs' first challenge is that of size, and so they suffer from inherent problems of being small, having limited resources and possessing weak bargaining power similar to those of most SMEs (Brooksbank *et al.*, 2004). Second, BACBs are under-researched in terms of their survival and growth within the Construction Industry. This was revealed in the literature review on investigating barriers that impacted on their growth and survival. Third, BACBs find themselves within an industry that is increasingly volatile, severely competitive and openly hostile in nature (McCabe 2006). Finally, the support available in order to assist in their survival and growth seem to be ineffective (Ram and Smallbone, 2001). The objectives of this paper are to first, establish the characteristics of the Construction Industry within which BACBs operate and describe some of the major problems encountered by BACBs. Second, critically review the existing support available to BACBs, and in the process identify the pertinent barriers that affect their survival and growth. Finally, discuss the solutions that have been offered to BACBs in assisting them to survive and grow. This paper presents useful insights into the economic and business activities of this group and should be of interest to others embarking on related topics.

2 The Construction Industry

Langford and Male (2001) discussed the Construction Industry in depth and highlighted its fragmented and vast nature and the fact that it actually consists of four distinct industries, that of (i) Building, (ii) Civil engineering, (iii) Repair and maintenance and (iv) Materials manufacture. These can still be sub-divided into market segments and sectors which have their various markets within which SMEs and stakeholders operate. This results in the fragmented nature of the industry, because some of the sectors exist independently, such as Civil engineering and Materials manufacture; whist others compete against each other such as the commercial and industrial markets within speculative development; and yet again, some of them form a symbiotic relationship such as social and private housing. Thus, this characteristic coupled with the fact that the vast majority of businesses, -ninety-five percent of them being SMEs does little to abate the challenges faced by BACBs.

The volatile nature of the Construction Industry results in many SMEs going into bankruptcy each year. McCabe (2006) described the peculiar problems within this Industry that have been identified as endemic and inherent such as high-unemployment, lack of training, economic uncertainty and erratic labour arrangements that have historically had detrimental effects on the smaller, more vulnerable companies and businesses. However, their small size may allow them to be flexible enough to adapt to this ever changing scenario within the Industry.

Langford and Male (2001) also highlighted that the industry has continued to change and adapt in areas were both Local and Central Government have intervened or produced legislation to effect such issues such as climate change and the use of alternative energy, sustainability and sustainable communities and a host of other initiatives that tend to attract funding for projects. The Client being a stakeholder now tends to initiate the procurement process. The need for ever increasing large, and complicated construction projects, moving away from traditional forms of building projects have increased considerably. Thus, pressure is exerted increasingly on the supply chain of the Main Contractor by their own supply chains. It is within these areas of procurement and tendering within the Public and Social Sectors that this competitiveness tends to manifest itself. Moreover, it is within these sectors that continuous and/or periodical work can be obtained by BACBs as opposed to the Private Sector. The bureaucratic procedures in the tendering and bidding processes and some of the initiatives, or practices such as 'partnering' that tended to exclude BACBs due to their smaller size, and would usually choose larger well-known firms. This increasingly hostile and competitive environment within procurement and supply chains areas has led researchers to identify barriers that help to stifle the growth of BACBs (Steele and Sodhi, 2004) and (Greater London Authority, 2007).

Thus, BACBs tend to be a vulnerable group because they are few and they face phenomenal challenges, barriers and obstacles such as social exclusion (Old Boy Network) and discrimination (Greater London Authority, 2007). It is within this context that the approach taken in the next section would critically examine what the policy makers are offering to this group. Are BACBs receiving adequate support which will assist in their survival and growth? Can this growth be maintained over several years? In the event that BACBs are not taking up the support, what are their reasons for such actions? What can be done, or what incentives can be offered to BAcBs in order to take up support? Are there any BACBs who believe that support will not assist their business growth, or that no support is required to achieve growth?

3 Support available to EMBs and BACBs

Britain has two decades' of experience of local public enterprise development agencies, and a variety of *business linkage* schemes run by the Department of Trade and Industry (DTI). This experience and tradition should show that the most Business Development Support (BDS) and linkage programmes should be beneficial, if not successful for the small business. However, the literature review discovered that these programmes which tend to be driven by commercial self-interest of firms collaborating together, but supported by both Central and Local Government have not been supportive to Small Businesses as well as Ethnic Businesses (Ram and Smallbone, 2001; Emslie and Brent, 2007)). This study focuses on *public support* (provided by the Government) as opposed to that of *private support* (provided by family, friends, experts, such as solicitors and accountants) provided for BACBs. This choice seemed appropriate because first, there has been more research in this area, so trends can be compared and investigated. Second, this support is provided by policy makers who can be challenged or lobbied in the event of their initiatives and policies and guidelines being ineffective. In the investigation of the barriers faced by BACBs, the literature review had to include Ethnic

Minority Businesses because majority of the research on support was targeted at the latter.

In the literature review *lack of support* or rather *ineffective support* and their impact on Ethnic Minority Businesses also featured as key aspects in terms of being barriers to their growth (Emslie and Brent, 2007). The literature review highlighted a plethora of providers of support that included Central and Local Government, Training and Enterprise Councils (TECs), enterprise agencies, such as Business Links and their personal business advisors, (PBAs) from whom information about the type and level of support can be obtained directly by these businesses. However, research has shown that even though a considerable amount of support has been available to these businesses, the take-up rate has been quite low as well as slow in some areas (Ram and Smallbone 2001; Baldock and Smallbone, 2003; Emslie and Bent, 2007). It may seem that these hurdles in obtaining support have not yet been quite fully understood by the support providers and the Government, and so the research will provide a deeper understanding as to why some of these problems still persist.

Ram and Smallbone (2003) were concerned about the support available, and realised that so much research had been carried out in densely populated areas in which they were located. Those businesses in the smaller, more remote towns, such as Devon and Cornwall had been neglected and were lacking in most areas of support. Although their research into forty-two firms, (fifty-five percent of these firms were in the Food Services and Hotel Sectors), it was relevant to this review because in their literature review they highlighted *barriers* to two important groups. The first group was Small Enterprises, (SEs) whose barriers were "lack of finance and limited business and marketing skills" cited by Curran and Blackburn in 1992 and 1993. The second group was EMBs, whose barriers were issues such as "perception of racism; low awareness and use of mainstream business support agencies and membership organisations" cited by Blackburn and Rutherford in 1999; Focus in 1999; and Marlow in 1992.

Emslie and Brent (2007) also carried out research, but on the marketing of support to EMBs by public sector support agencies. Although their methodology was to carry out in-depth interviews and so produced a lot of important and vital information, it was a tentative study and very restricted as it covered a very small sample of six public sector providers and was limited to Glasgow and Edinburgh. They acknowledged the existing barriers to growth, which were *competitive environment, lack of finance* and *the lack of managerial resources* and were prevalent across the various groups of SMEs, EMBs and BACBs. However, they highlighted the additional barriers to growth which were an "*extra layer"* encountered by EMBs given by Barclays Bank in 2005; Ram and Smallbone in 2003; Welsh et al in 2003; and CEEDR in 1999. The low uptake of business support services by Ethnic Minority Businesses were also highlighted by Emslie and Brent (2007) as "lack of awareness of support agency; lack of understanding and interest of the types of support available; doubts about the relevance of what is offered; advice, finance and assistance were sought from within the owner's own social network of family and friends; perceived cultural differences and confusion caused by the continued fragmentation of the support infrastructure". Whereas the reasons why support providers thought the propensity was low were that there were "problems when identifying and reaching the business in question; the inappropriateness of product-

oriented approaches offered by support agencies; lack of ethnic minority advisers; the lack of data; the lack of recognition of the specific needs of Ethnic Minority Businesses and the lack of understanding of the business environment by the supporters cited by (Linehan and Sosna in 2003; Ram and Smallbone in 2001; and Ram and Jones in 1998.

4 Barriers encountered by BACBs

Their Annual Small Business Survey of Small Businesses which included a booster survey of Ethnic Minority Businesses discovered that the most important barriers to growth within that group were competition, recruiting staff, the economy, regulations and obtaining finance (SBS 2006). However, there were distinct differences: *Cash-flow and taxation* impacted more on SMEs, whereas *recruiting staff and obtaining finance* impacted more on Ethnic Minority Businesses. The review will focus on those barriers of survival and growth that are unique and specific to BACBs. Barrett et al 2000 cited some *barriers* that impacted on small businesses such as poor access to credit facilities; having an impoverished customer base; owning out-dated rundown premises and having to pay high insurance rates for their premises. These barriers and constraints may not all have been relevant to the BACBs.

The study by Steele and Sodhi (2004) identified barriers that prevented BACBs from getting contracts from Housing Associations. These were in terms of evaluating the fairness and equitability of the social housing sector, there was the lack of willingness to give constructive feedback by the housing associations to a BACB that would assist them in the event of that particular company bidding for further work in deciding on successful tenderers. This was just one of the several areas identified as being a disadvantage to potential tenderers. Others identified were the lack of flexibility by some Housing Associations in terms of payments, previous experience and insurance levels.

The Greater London Authority (GLA, 2007) commissioned a research in London which identified several *barriers* which were experienced by BACBs such as “lack of training; social exclusion (Old Boy Network), discrimination, lack of understanding of diversity with Client bodies; lack of overall strategic policies by Government; the unwillingness to change and the closed social networking groups”. The barriers encountered by these groups when attempting to get contracts were “the lack of training and experience; lack of track record; insufficient resources; lack specialist capabilities and insufficient turnover”. Steele and Sodhi, 2004 revealed barriers encountered within the procurement process within the Social Sector were “the lack of transparency of the bidding system; inconsistencies of the implementation of the policies of the stakeholders; and inability of businesses to cope with large contracts”. A taxonomy of barriers encountered by EMBs over recent years is shown in Table 1. This table gives a chronological snapshot of the barriers to growth experienced by EMBs and BACBs over several years. Majority lie within the procurement procedures and bidding for work, and there has been little change in four years. The cultural and socio-economic barriers tend to be within other industries such as Retail, Catering and Hotel Management. These barriers are also wide and far- reaching. The support that would be required would need to counteract, lift and/or abate some of these barriers.

5 Conclusion

The characteristics of the Construction Industry is set to deteriorate in terms of its volatility with regards to the economic impact of the credit crunch. Hostility is still widely practiced in the implementation of some European Directives which result in the exclusion of a significant amount of SMEs and BACBs from bidding for contracts. Complexity and fragmentation are characteristics that are inherent due to the complex nature of buildings and procurement methods, the vast scale of projects and considerable range in costs for project work. Thus factors do not assist the plight of BACBs. Though there was considerable research on SMEs, the tendency is that there is no distinction made between the groups of Ethnic Minority Businesses and SMEs. The Government, Construction Industry and Stakeholders are therefore likely to be uninformed as to whether the latter encounter specific problems due to their ethnic origin or that they have identical problems that can be solved along with the main stream of SMEs.

There was very little research carried out on BACBs. However, the sparse information that is available by two researchers have revealed that they did encounter barriers, but there were limitations to the two key research studies by Greater London Authority (2007) and by Steele and Sodhi (2003). Considerable amount of funds and resources are being allocated to the different support organisations and impoverished areas are being targeted by the Government through regeneration grants and other incentives to assist SMEs and EMBs. There were a minimum of twelve reasons why the support take-up rate by EMBs was low. Some of these reasons were cultural and socio-economic that would need more input in the type of training and experience required by these Support Workers in order to implement good quality support.

The barriers faced by BACBs in the process of bidding for work within the Social Sector were the lack of transparency of the bidding system; inconsistencies of the implementation of the policies of the stakeholders; inability of businesses to cope with large contracts (Steele and Sodhi 2004). Some of the other barriers faced by ethnic minority groups in other sectors were language barriers, cultural issues, lack of confidence, the effects of racial prejudice, access to finance, concentrated in activities with high failure rates and over concentration in low entry threshold activities (Ram and Smallbone 2003).

One reference to BACBs' economic worth was made by the London Development Agency (LDA) which stated that "if London's Black, Asian, Minority and Ethnic (BAMEs) businesses in all sectors can achieve a turnover by employment and /or enterprise seen across all UK enterprises, total revenues would increase by almost £10bn and at least 50,000 jobs created" (SBS 2006). These figures would have to be treated with some caution as the report has allowed for double counting, as some ethnic businesses tend to fall under more than one category of ethnicity. In the event of any major threat to the existence of BACBs, both the Construction Industry and the UK economy would encounter loss of revenue, skills and diversity that the group contributes.

Table 1. Taxonomy of barriers for EMBs and BACBs

Barriers	Author	Date
Poor access to credit facilities	Barrett et al	2000
Having an impoverished customer base		
Owning out-dated rundown premises		
Having to pay high insurance rates for their premises		
Lack of finance	Baldock and Smallbone	2003
Limited business and marketing skills		
Perception of racism		
Low awareness and use of mainstream agencies		
Low take-up of membership organisations		
Over concentration in low entry threshold activities	Ram and Smallbone	2003
Language barriers		
Cultural issues		
Lack of confidence		
Lack collateral		
Concentrated in activities with high failure rate		
Bureaucratic procedures in the tendering and bidding for contracts	Steele and Sodhi	2004
Unwillingness to give constructive feedback for unsuccessful tenders		
Lack of flexibility in terms of payments		
Previous experience and insurance levels		
Behavioural characteristics	Smallbone et al	2005
Types of problems that they face		
Lack of professional business and management skills		
Lack of financial management; cash flow problems		
Breaking out		
Lack of track record; insufficient resources	Greater London Authority	2007
Lack specialist capabilities; insufficient turnover		
When bidding for contracts, CBABs receive following no feedback; lack of training and experience		

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Status of prerequisite and Hazard Analysis Critical Control Point (HACCP) Implementation in Buildings for food business: Methodological Perspective

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Abstract:
HACCP system is a tool assesses hazards and establishes control systems that focus on prevention rather than relying mainly on end-product testing. Food industries today require intensive controls during their processing, storage and distribution. The HACCP system can guarantee the safety of food products. However HACCP is not the first step to food safety, first there must be some general procedures often described as the pre-requisites to HACCP. Prerequisite may include: building constructions; hygienic facilities, receiving of raw materials, also equipment design, installation, and maintenance, hygienic practices, Sanitation programme, and pest control programme. Once these are in place, HACCP, which is focused control on specific hazards, is then the final step in securing the safety of food. Furthermore, there is a lack of studies on implementation of HACCP system in Arabic countries and not one of those studies was carried out in Libya context. Therefore the research methodology has been designed with aim of this research by identify what, if any, food safety program are established in, and the status and situation of the prerequisite in the market. The results show that the management opinions confirm the advantages of HACCP. However, handling practices were not being followed in Bab albahar market; many of these practices represent prerequisite programs that must be in place before HACCP. This it may be a key to successful implementation of food safety and HACCP programs in this area. This paper will detailed on the methodologies adapted to fulfil these aims.

Keywords:
Food Safety, HACCP, Prerequisite programme, Research Design and Methodology

1 Introduction

HACCP is economical and effective administration system of controlling food safety. Nearly 30 years ago, HACCP has become internationally. HACCP is not the first step to food safety, legislation demands that first there must be safely designed and constructed building, environmental hygiene, and preventative maintenance with the necessary facilities and equipment, there are also some general procedures often described as the pre-requisites to HACCP (WHO, 1999). food safety is go through a period of change, rising nationally by increasing consumer concern for foodborne disease and internationally by demands for food hygiene and a food safety control. In this context,

the demand for complete control, from source to table is grow (Taylor, 2006).. HACCP is important for the food industries due to a number of reasons make concerns over safety in the food industry as growing trade in fresh produce, with a much higher risk of contamination, the increasing numbers of new or re-emerging pathogens that have the potential to contaminate food (Suwanrangsi, 2002). In response to these safety concerns, fresh food have been one of the priority sectors for the introduction of HACCP systems to ensure that products are safe for consumption and further processing. in Libyan There are significant quality problems in food industries which result from handled. Fresh food rapidly decay, also has been the vehicle for a variety of pathogens and toxins like viral gastroenteritis, histamine ets. Since Libya has a warm climate, the spoilage is quickly than in a cool environment. Apparently Quality problems affect the reputation of Libyan food in the market. What is more, is Libya's intention to enter the World Trade Organization so this demands Libyan exports production agrees with the requirements of WTO? Consequently , it needs very good quality assurance system start in handling, transporting, processing, marketing and storage, in both export and local industry to prevent a major problem in terms of both health and economies significance.. The aim of conducting this research is to investigate the level of HACCP system implementation in seafood premises in Libya. By identify and evaluate the elements of a food safety management system those are in place in the premises and to review the relevant literature on the concept of HACCP system and food safety management in general as well as to check those features that contributes to ensure the safety of food which is divided into five parts namely ‘premises: regarding location; equipment, personnel hygiene, training, instruction and supervision. This study is a summary of PhD project concentrate on investigation of current situation of the level of HACCP implementation in the Bab-albaher market in Tripoli. The paper including the need for the research, the research questions, the expected contributions to the body of knowledge. The researcher will utilize different types of research methodology. The research will then go on to discuss the Possibility to implementation HACCP system in Libya and highlight the key elements for why did not adopt HACCP in Libya.

2 Literature review

HACCP system was already developed in the early 1960s in the USA in order to produce safe food for the space programme (Bauman,1995). HACCP is not the first step to food safety. Legislation demands that first there must be safely designed and constructed building, environmental hygiene, and preventative maintenance with the necessary facilities and equipment, there are also some general procedures often described as the pre-requisites to HACCP, or Pre-Requisite Programmes (PRPs) (WHO, 1999). This term used to describe all those activities, other than specific HACCP plans as ‘Good Hygiene Practice’ (GHP) or ‘Good Manufacturing Practice’ (GMP) that need to be ready before starting with HACCP. According to Wallace and Williams (2001), the prerequisite programs are include :

1. Premises: Out side Property, Building, Sanitary Facilities, and Water/Steam/Ice Quality Programs.
2. Transportation and Storage Food Carriers, Temperature Control, Storage of Incoming Materials, Non-food Chemicals and Finished Product.

3. Equipment: General Equipment Design, Equipment Installation, Equipment Maintenance, and Calibration
4. Personnel Training, Hygiene and Health Requirements
5. Sanitation and Pest Control Sanitation Program, Pest Control Program
6. Recalls: Recall Procedures, Distribution records

These general procedures are common to most businesses and most products, and are important in keeping everything running smoothly and safely. HACCP, which is focused control on specific product/process lines, is then the final step in securing food safety. Figure (1) shows the first four elements of a safe food operation which should be dealt with before you start with HACCP (Taylor, 2006). Figure I: Elements of a food safety operation

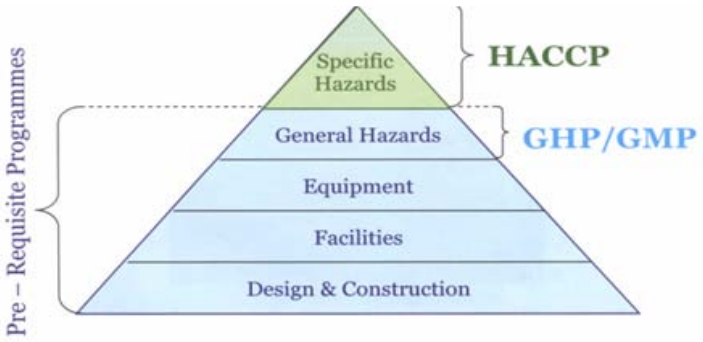


Figure I: Elements of a food safety operation

The successful application of HACCP requires the full commitment and involvement of management and the work force. It also requires a multidisciplinary approach; this multidisciplinary approach should include, when appropriate, expertise in agronomy, veterinary health, production, microbiology, medicine, public health, food technology, environmental health, chemistry and engineering (Codex, 2003).

The use of HACCP systems in the food industry is now global. Since it first emerged, the concept has increased in importance, through its endorsement by Codex Alimentarius at the international level and by the European Union (EU) and the USA. Currently over forty countries have announced HACCP initiatives for the control of food production, processing and distribution Untermann, (1999).

HACCP is important for the food industries due to a number of reasons make concerns over safety in the food industry as growing trade in fresh produce, with a much higher risk of contamination, the increasing numbers of new or re-emerging pathogens that have the potential to contaminate food (Suwanrangsi, 2002). In response to these safety concerns, fresh food have been one of the priority sectors for the introduction of HACCP systems to ensure that products are safe for consumption and further processing. In conclusion reducing the spoilage of fresh food will require continued and coordinated efforts by many different agencies, including those involved with quality;

harvesting, processing, marketing and consumer education. It was believe that HACCP found to be an effective approach for monitoring product safety and quality. In addition to Shift the sector of industries from the classical 'quality control and inspection approach' to an integrated HACCP system of the entire chain: production, handling, processing and marketing.

3 Research Questions

- To what extent is the prerequisite and HACCP system used in the Libyan food premises?
- What are the factors that affect the implementation of HACCP system in Libya?
- How can the effective implementation of HACCP system be adopted into the Libyan food premises?

4 Expected contribution to Knowledge

- The main contribution will be contribute implementation of HACCP system in to the food industry in Libya
- Recommendation which may help in shifted the sector of food industry from the classical 'quality control and inspection approach' to an integrated HACCP system.
- Implementation of regulatory HAACP-Based food Inspection Programs.
- Using of HACCP data in the provision of task-related food hygiene training.
- This research will provide addition knowledge on implementation of HACCP system in all food sectors in Arabic countries and in Libya in particular.
- The possibility of the identification of unique barriers that affect implementation of HACCP system in Libya

5 Research Methodology

Because of the absence of any studies deals with implementation HACCP system in to the food industry in Libya particularly, and rarity of studies in this field in Arabic countries in general, an exploratory methodology can be the best to explore the level of HACCP implementation in to the food industry in Libya. And based on the characteristics and the nature of this research as the researcher wants to gather rich information in order to investigate the level of HACCP implementation in Libya, the phenomenological approach will be selected as the research philosophy.

The researcher has chosen to combine the deductive and inductive approaches, the two main research approaches according to (Collis and Hussey (2003)) to achieve the objectives of the study. combining deductive and inductive approaches within the same piece of research was encourage by Saunders et al. (2007) as it is impossible to go theory-free into any study (Richards, 1993).In this research, a list of elements necessary to assess level of HACCP implementation will be derived from the literature and then

investigated in the case study institutions (deductive). After that, the findings from the fieldwork will be incorporated into the existing theory (inductive).

5.1 Research Strategy

The point of the research design or strategy is to satisfy the research aim and objectives. There are a number of research strategies in social science research which include; experiments, Surveys, histories analysis of archival information and case studies (Yin, 2003, p. 1).

Case study defines as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" Yin (2003, p.13). Moreover, the case study is appropriate strategy when 'how' or 'why' questions are being posed, which allows the researcher to determine not only what happened but also why it happened furthermore it is also recommended when the researcher has little control over the events and when the focus is on contemporary events (Yin (2003). This research will answer the research questions what are the level of implementation of HACCP system in Libya? And what are the barriers that affect the implementation of HACCP system in Libya? .The event is contemporary and the researcher has no control over this phenomenon, therefore a Case study research was chosen in this study, since it will be useful for exploratory studies of this kind. It is expected that this approach will provide an opportunity to explore level of HACCP implementation in Libya in some depth through organize piecing together of detailed evidence in context (Yin, 1994). Case study strategy has been selected to gain the depth of understanding of the information necessary to identify the possibility of Libya for implementing HACCP system.

5.2 Selection of Case Study

In the Marian sector, the Bab albahar fish market in Tripoli is sought as an effective case study which can be satisfied as the unique and important case and has enough criteria for the study. The following are reasons for selection of the case study:

- The new Bab albahar fish market is the only Libyan Public organization specialized in selling fish. To answer the research questions and in order to achieve the best selection among the fish market in Libya and to guarantee the best sources of data relevant of current research, the big, new, and permanent fish market was selected for this research. In addition, the rationale for choosing the new and permanent fish market is that it is assumed that this experience will be circulated to the rest of the Libyan markets.
- On the other hand the permanent fish market was chosen because it will enable the identification of current barriers faced by the market.
- The Bab albahar fish market is situated in Tripoli, Libya's capital city. This feature allowed the researcher to contact the department easily and considerably reduce traveling time and cost.

The selection of this permanent fish market would give strength to the research and will give the author the full picture regarding the impact of barriers affect the

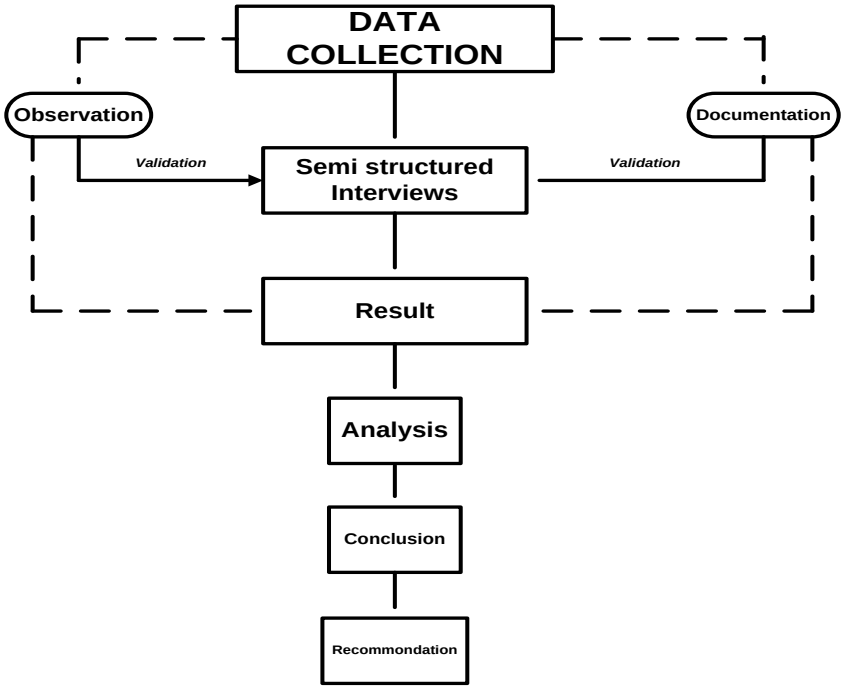
implementation of HACCP in fish market in general in Libya, and that would help in achieving the research aim.

5.3 Data collection methods

Because there are no "one method fits all" studies, the specific requirements, research nature, and objectives of research will usually dictate the appropriate method or methods to use. Additionally, each method of data collection has its strengths and weaknesses, and these varied methods allow researchers to evaluate which method is most appropriate for a given situation. According to Collis and Hussey (2003,) there are two major types of data collection primary and secondary data.

Primary data: is data that were collected specifically for the purpose of this study (fieldwork). Secondary data: were data collected for another purpose but are related to the subject of the study, and which the researcher has gathered to build the theoretical base for this study. The sources of these data were mainly: Referenced books, papers, articles, researches, thesis, magazines and Internet. In this research both primary and secondary data were used. However, studies on the subject of food safety in general and on HACCP in particular in Libya are very limited, and related published data/information are also, rarely available. In general, the process of assembling data on HACCP in Libya has proved a difficult challenge (Ghenghesh *et.al,* 2005; El-Sharef, *et. al*, 2006) Hence; it is worth mention that most of the secondary data/information used in this study has been obtained through direct contact with different sources during fieldwork in Libya. National and local official documented data on food safety, food control in general and seafood safety in particular were collected mainly from the Secretariat of marine, marine biology research centre and the Secretariat of Planning. Yin (2003) listed five sources of evidence for data collection in the case study: Documentation, archival records, interviews, observation, and physical artefact. All sources might be complementary and could be used in cycle. Thus a case study should use many sources, on condition that are relevant to the study (Yin, 2003).
In this research, the author will use Triangulation method, semi-structured, face-to-face interviews as the main source of data collection as will as direct observation through checklist and photography. Collection of supporting documentation also is used for research validity and reliability.

Triangulation has been employed in this study because a single method is not adequate to solve the problem of various factors under investigation. Moreover, this method enhances the validation of collected data.



Case Study Information Sources Triangulation

5.4 Justifications for Choice of Data Collection methods

The use of several data collection methods i.e. interviews, documents, and observation within one case study is intended to increase the validity of the findings and the researcher confidence in the reliability of the information obtained. This is supported by many authors. Moreover, the Individual in-depth interview allows respondents to talk at length in their words and at their own level of understanding to gain in-depth understanding of the phenomena of this study. The interviews will be conducted with the leadership, top management and middle management from the different departments within Marian secretary, marine research centre, fish market under investigation, and expertise in food science and technology.

Using top management, middle management in case study is a strategy used by the author to collect different views about different types of information, factors and barriers and to analyse, in-depth those information. Additionally, understand more in-depth the impact of Job situation in these issues. Covering those levels can enhance the validity of the study by getting different points of view.

A total of 14 interviews were contacted by the researcher. The study population was dominated by the Ministry of marine wealth, followed by the Marine biology research centre, with the remaining made up by Bab albahar market; Libyan export promotion centre; Counsellor on Minister of Planning and food technology expertise.

6 Preliminary Findings

The preliminary results show that the leadership and top and middle management opinions confirm the advantages of HACCP. However, appropriate seafood handling practices were not being followed in Bab albahar fish market and prerequisite food safety programs for HACCP as GMP, GHP were found to be inadequate in the market. However, as soon as things go wrong, there is the realisation that pre-requisite programmes are the foundation for simple straightforward HACCP (Wallace and Williams, 2001).

Employees in the sector of marine were found to have a significant amount of food safety knowledge, leadership and top and middle management including the manager of the market with who had high qualifications were found to have higher food safety practice and information. Also it was found that there are important food safety practices that Bab albahar fish market has not implemented. Many of these practices represent prerequisite programs that must be in place before HACCP can be implemented.

This preliminary result suggests that assigning responsibility for food safety to specific employees increases the number of food safety practices implemented in market. Also, kind of education should be considered in the hiring process, as managers with specialists in the area of food safety are more likely to implement food safety practices. Further, more opportunities are needed for basic food safety training of employees at the market. However, some practices related to food safety can be implemented with little or no cost to the operation. Checking temperatures of fish as it arrives, developing a policy on hand washing, recording temperatures inside the market and in the fish storage, all are steps that a manager can take, with little time and minimal effect on the foundation line, to help ensure the safety of seafood. Results from this study indicate that Bab albahar do not have written policies and procedures. These need to be developed to provide the basis for training and HACCP implementation. Model standard operating procedures for Bab albahar could be developed. Secretary of marine also should consider giving one or two employees major responsibility for seafood safety, as this affects the number of food safety practices implemented. This it may be a key to successful implementation of food safety and HACCP programs.

7 Conclusion and Further Research

Results of this study indicate that important food safety practices relating to prerequisite programs and HACCP implementation need to be implemented in Bab albahar market. whereas some practices would require training for both workers and managers, some practices, such as ensuring that the market are away from environmentally polluted area, write procedures for cleaning and sanitizing equipment, chemical storage, written policies on hand washing, and use of hair restraints and gloves, are simple to implement and require a small amount of funds.

Manager of the market faced with great challenges to implementing food safety and HACCP programs. Workers knowledge, law enforcement, and manager knowledge are

the top three barriers identified in this study. The ministry of health and environment should focus efforts on food safety employee education and provide HACCP training for all food premises managers. Sanitarians can play a key role in improving food safety in the market.

Supplementary work should be conducted in one of the main companies (premesis) of food manufacturing throughout Libya in order to gain an overview of presence of elements and prerequisites of HACCP to investigate the level of HACCP implementation and possibility of applying this system in the area of production.

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Theme 2

Design and Urban Development

Transformation of existing housing: what aspects should be considered to design envelope directed strategies?

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Abstract:
The European social housing estates built after WWII are deteriorating. The building envelope (facades and roof) is highly responsible for decay, maintenance costs and energy consumptions. Strategic transformations of this part of the stock can contribute reducing energy consumptions to meet European energy targets. With this respect, wherever demolition is no option, adopting physical solutions directed to the envelope leads to higher energy saving and better livability. Sustainable approaches however, are not common yet. Renovation in the Netherlands focuses on limited aspects and energy efficiency is not a driving concept or is implemented in exceptional cases. Much worse is the situation in Italy, where renovation is not applied at all and interventions are mostly driven by major repairs and maintenance. The aim of this research is to provide design solutions to develop renovation strategies directed to the building envelope. This is achieved by structuring a matrix collecting solutions and recommendations. The main question is: how to design envelope strategies improving the quality of post-war social housing in the Netherlands that could be also be applied in Italy? In this paper, it is presented the work in progress to answer the sub-question: what aspects should deserve attention to design envelope strategies in the Netherlands? The preliminary outcomes are described through five sections: introduction to the problem, research methodology, overview on Dutch renovation practice, general aspects to be considered to design envelope strategies and conclusions.

Keywords:
Building envelope, social housing, sustainable transformation

1 Introduction

Most of the social housing neighbourhoods in Europe have been realized after the Second World War (van Beckhoven et al, 2005). The demand for housing in the post-war period necessitated the rapid production of large numbers of dwellings with less emphasis on qualitative aspects (Andeweg et al., 2007). This massive housing stock is decaying fast. According to the “Building Decay Surveys” issued by the Federal Government of Germany, 80% of all European building decay is found in urban building envelopes that is roof, walls and foundations. The envelope is responsible for

most of the maintenance costs and its quality often does not meet current demand and standards (Andeweg et al., 2007).

According to the European Commission, the member states and the associated states, the need for sustainable refurbishment is high (SUREURO, SUstainable Refurbishment EUROpe). The European residential sector, in fact, currently accounting for about 27% of the total energy consumption in Europe, offers a great potential to reduce CO2 emissions by energy efficient housing (Cecodhas, 2007). Sustainable transformation is of growing importance especially in the view of the ambitious European energy targets: reduce by 2020 greenhouse gas emissions comparing to 1999 by 20% and ensure 20% of renewable energy sources (Commission of the European Communities, 2007). The building façade ranks among the highest in energy consumptions of buildings (EPA - ED, 2007). It is estimated that measures like roof and walls insulation alone, that are envelope directed solutions, can cut energy use of buildings in half, reducing energy use across Europe by 20% (Esteves, 2007).

In 2005, a report published by Federcasa (Italian Housing Federation) showed that, on the average, Italian housing institutes manage limited maintenance strategies and low investments (Pozzo, 2005). Actually, apart from a few exceptions in the North of the country, renovation in Italy is almost absent. Already in 1986, the government registered that 3.5 million dwellings realized in the previous decades were poorly constructed and that 1.590.000 multi storey houses were at risk (Mezzetti et. al., 2003). Major problems affecting Italian building envelopes regard insufficient thermal and acoustic insulation (Andeweg et al, 2007). Frequently, also basic protection from atmospheric agents is lacking. Clearly, the absence of investments on proper intervention strategies contributes to the reinforcement of the deterioration processes.

The situation in Italy is profoundly different from the one in the Netherlands where restructuring of social housing is on the agenda since the late ‘60s and ranks high for the coming years (VROM, 2007). Common measures to improve the functional quality of housing regard, for example, moving walls or adding volumes on the top floor (so called “optoppen”) (Brandes et. al., 2000). According to SenterNovem, the rental and the owner-occupied housing stock lack insulated glazing, roofing, outside walls, and ground floors (VROM 2007, Cijfers over Wonen 2006). The existing level of thermal insulation fells short comparing to the current standards. Energy performance of the building envelope is still the most important and urgent problem (Koopman, 2007). This is crucial considering that the Dutch government even raised the European energy targets (30% reduction of greenhouse gas emissions in 2020 and 50% in 2050. SenterNoven, 2007). By 2020, 30% of energy will have to be saved in 2.4 million existing dwellings and other buildings (VROM, 2008).

2 Overview on Dutch renovation

The NRP provides an overview on many examples and good practice of renovation realized in the recent years. Good practices are ‘actions which could be recommended for further application whether in a similar or adapted form’ (Minnery et al. 2000). By observing the projects submitted to the NRP, it can be argued that envelope strategies are not common and that two major strategies are typically adopted: ‘renovation light’

and ‘high-level renovation’. It seems there is no standard definition distinguishing those terms (pers. comm. Ouwehand and Helleman, 2007) but their meaning is diffused in the practice. Both the strategies intend to improve the initial quality of the building. High-level renovation, however, is more profound and leads to higher quality by moving the (inner and outer) walls to improve, for example, housing differentiation.

Among the examples collected into the NRP archive, just a few exceptions are driven by sustainable concepts (like re-using of the casco structure as in the Complex 50) or apply solutions directed to save money on energy bills (like adding thermal insulation in Enschedelaan to save 70%) (NRP, 2007). However, an exception that is not included in the archive is the renovation of the high-rise in Poptahof, Delft (under construction). Co-financed by the European Commission, it is aimed to reach the energy standard of new dwellings by adopting energy saving in the building envelope, installations and measures to stimulate energy conservation behaviour (www.concerto-sesac.eu, 2008). Architectural appearance of the exteriors seems to be dominated by interventions preserving its most relevant characteristics (like rhythm, geometry, detailing, materials and textures). A few renovations are characterized by a profound conversion of the original appearance of the ‘60s/’70s into a contemporary fashionable product, like for example the De Leeuw van Vlaanderen or, more radically, the Osdorperhof. But they are driven by exceptional local circumstances therefore can not represent the common practice. The architectural debate on preserving or not existing exteriors seems to be driven by the initial state of the building. For especially the early post-war housing stock, in fact, there are divergent opinions among Dutch architects on whether or not it has a certain architectural quality. Accordingly, some architects try to keep the original features intact while renovating the interiors and others try to alter the appearance of the building block as much as possible and to give these blocks a more up market look (Andeweg M. and Koopman W.A.F., 2007).

In this study, to designate high-level renovations profoundly strengthening distinctiveness of the exteriors comparing to the initial architectural appearance and improving energy efficiency, it is used a simple term: (extreme) ‘makeover’. Even if it does not apply to architecture, its definition can be elaborated to describe such renovation concept: 'a set of changes (envelope directed solutions improving sustainable-functional aspects) that are intended to make a person or place (the building) more attractive' (Cambridge Dictionary, 2005). Extreme makeover is a profound envelope strategy that elaborates on the concepts of ‘stripping’, 'taking everything away till only the construction frames of the houses are left and floor plans can be newly arranged', and ‘pimping’, 'making housing more sustainable without forcing to more' (Hal, 2008). The key works underlying extreme makeover are: environment, functionality and distinctiveness (sustainability, functional and architectural aspects) (Fig.1).

The described sustainable problems, architectural aspects and the concept of extreme make-over inspired the questions in the questionnaire developed to address personal opinion of professionals on what aspects that should be considered to design envelope strategies

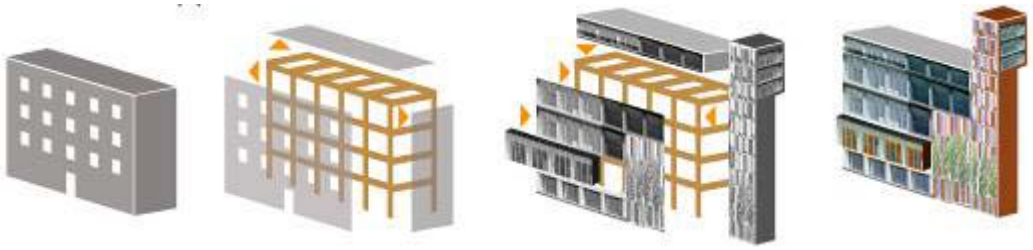

Figure 1: A profound envelope directed strategy: extreme makeover.

3 Research Methodology

The topic of enquiry of this research is the transformation of the post war social housing stock. It resides in the architectural domain. The naturalistic paradigm is applied in that the dominant mode of research design is based on qualitative research strategies (Groat and Wang, 2002). The research problem can be described as follows. Common renovation approaches applied in the Netherlands need more attention especially for what concerns energy efficiency of the building envelope that is crucial to meet the European energy targets. There is a need to develop alternative strategies of intervention to improve the quality of housing to greater extent. In Italy renovation is not applied at all and interventions are mostly driven by major repairs and maintenance. To prevent reinforcement of decay processes effective strategies need to be developed and adopted. The aim of this research is to provide design solutions to develop envelope directed strategies. This is achieved by structuring a matrix collecting solutions and recommendations. The main research question is: how to design envelope strategies improving the quality of post-war social housing in the Netherlands that could be also be applied in Italy where renovation is lacking? Four sub-research questions are also defined:

1. What are good solutions applied in Dutch renovations that can be extrapolated to design envelope strategies?

2. What aspects should deserve attention to design envelope strategies in the Netherlands?

3. What solutions and recommendations can be adopted to design envelope based renovation projects in the Netherlands and Italy?

4. How would it be possible to implement envelope directed strategies in Italy?

The research design is organized in four studies. Each one provides the answer to one of the four sub-research questions. The whole research strategy is based on combined strategies in that to each study it is applied a method and a tactic. In this paper, it is described the work in progress to answer the second sub-question. This part constitutes the descriptive section of the research which aims at noticing major themes and clustering information on the Dutch practice of renovation. The strategy applied is qualitative interview to key actors (a social interaction, a dialogue and interchange between two persons about common areas of interest. Feminías, 2004). It is adopted the tactic face-to-face semi structured questionnaire. For credibility, information collected during the interviews is supported with data from multiple sources (like proceedings,

books, power points, brochures and internet sites). But this phase of the study is still work in progress and constitutes the major focus of the coming months. A few literature references are used in this report to integrate and support the textual narration of the preliminary outcomes.

The interviewed are professionals from universities, research institutes, knowledge centres and architecture firms. Fourteen people are interviewed, all of them between 2006 and 2007. The average duration of an interview is 1,5 hours. In this paper are reported preliminary outcomes from the analyses of nine interviews. The guiding face-to-face questionnaire is divided in two parts both asking personal opinion of the interviewed. The first part collects questions on the Dutch practice of renovation while the second on an example of envelope directed strategy. In particular, in the last part they had to mention obstacles (weaknesses) and advantages (strengths) concerning the implementation of that strategy. The structure of the guide is mainly based on qualitative observations of the projects showed in the archive of the National Renovation Prize (NRP), a well-known prize awarding best practice of renovation in the Netherlands (for a brief description, refer to Section 2). If necessary to stimulate the discussion, the professionals were asked to comment on realized and unrealized examples of renovation they already knew. For further argumentations, a few images were informally showed the interviewed. The images were also used to explain envelope directed strategies and the concept of extreme make-over. Despite the risk of affecting personal opinion, this strategy turned out to be effective. The interviewed were able to mention further examples of realized and unrealized projects as well as other experts to be consulted.

For systematic qualitative analysis of data, it is used the software Atlas.ti. It allows managing, extracting, comparing, exploring, and reassembling meaningful pieces from large amounts of data in creative, flexible, yet systematic ways. It is used to elaborate texts, mostly transcripts from interviews (Evers, 2005). In this study, it was used to quote and code parts the transcriptions and to create the output text according to predetermined criteria. The coding process is based on two phases and three criteria. In the first phase, it is applied an open coding approach in that quotations are coded with no prefixed themes. In the second phase it is adopted a selective coding. Codes are defined from the already defined themes in the interview and attached to the quotations (Feminías, 2004). For the quotations are used the following criteria: emphasis (time spent by the interviewed on the topic and number of time he mentions it), frequency (different people mention the same topic) and references (type and number of sources mentioned to support a topic). On the basis of this double coding it is structured a scheme grouping similar codes into clusters. Following this scheme, it is developed the textual narration of the aspects that should deserve attention when designing envelope strategies in the Netherlands.

4 General aspects to design envelope directed strategies

Form the analysis of the qualitative interviews elaborated so far, it emerged there are five major clusters of aspects. Such clusters and their respective codes are illustrated in table 1. 'Sustainable transformation' includes the most important energy related aspects. It mainly concerns the importance, the willingness, the lack of knowledge and the

financial difficulties to improve energy performances of existing blocks. 'Architectural aspects of buildings' gathers those aspects concerning the design of a renovation like the lack of creative thinking, the advantages of creating added value by combining aesthetical and functional solutions, and the importance of considering wishes and preferences of people. 'Image of neighbourhoods' concerns those aspects that might be considered to make a deprived area more attractive like the strategic location of distinctive projects, the importance of making the transformations visible from the outside and the need to improve housing differentiation. 'Implementation of renovation' groups those aspects concerning the practice. It mainly regards the gap between experimentation and common approaches. Finally, the cluster 'restrictions to renovation' gathers those aspects that should be considered when deciding to go for ambitious projects. It deals with general obstacles like the housing market, the common thinking and place related circumstances.

'Sustainable transformation'	'Architectural aspects of buildings'	'Image of neighbourhoods'	'Implementation of renovation'	'Restrictions to renovation'
Interest and willingness	Creativity	Bad reputation and image of the area	Experimentation and practice	Contextual factors driving renovation
Difficulties	Additional qualities	Differentiation of the built environment	Expertise of professionals	Restrictions due to the building quality
Strategic renovation	Attractiveness of transformation	Distinctiveness of the blocks	Renovation strategies	
Design of sustainable renovation	Integration of technical devices		Combining approaches	
	People living in the building		Mixing groups	

Table 1: The code scheme: five clusters of aspects to be considered to design envelope strategies

4.1 Aspects based on Dutch renovation

'Sustainable transformation'. Sustainable housing transformation is difficult and time pressure due to European energy targets makes it even more ambitious (van Hal, 2008). Rising awareness and stimulating motivation in ‘acting sustainable’ are crucial (pers. comm. Hamers and Bonet, 2007). Due to the raise of the costs of energy, there has been a growing interest of housing associations and public administrations in sustainable renovation (pers. comm. de Haas, 2007), but it is not transferred to the practice. Despite renovation (often) offers the best chances to go for sustainable solutions (Thomsen and van der Flier, 2008), sustainability is not jet a driving concept.

Sustainable solutions are expensive and energy is still a big challenge for housing associations (pers. comm. Bonet, 2007). It is also a matter of willingness to invest (pers. comm. Hamers, 2007). The motto should be: “More energy at fewer costs!” (pers. comm. de Haas, 2007). In case of solvable structural and functional problems of dwellings, a combination of persuasion (communication of environmental impact of demolition and perspectives of renovation) and seduction (subsidies) may lead housing associations to the decision to go for of sustainable transformation (Thomsen and van der Flier, 2008). However, the general lack of knowledge on energy directed solutions and the effort required for their application, still affect housing association applying sustainable solutions. Only a few are innovating (pers. comm. Bonet, 2007). Decision

makers are not familiar with energy issues and long term sustainable thinking is not common yet (pers. comm. Hamers, 2007). Sustainable renovation depends on the vocation of the parties involved (pers. comm. de Haas, 2007), thus housing associations should take their own initiative in investing on a sustainable future. Strategic sustainable renovation should look at the future (pers. comm. Bonet, 2007). Buildings should be converted into energy producers (pers. comm. Hamers, 2007). It would be better less renovations but at the highest energy target (pers. comm. de Haas, 2007). What is strategic is to renovate a few blocks but at the highest target (pers. comm. de Haas, 2007). Sustainable renovations should be implemented as a whole concept (combining thermal insulation, ventilation, air quality and health, cold bridges, noise, low energy systems and efficient heating system (pers. comm. de Haas and Hamers, 2007). It should also aim at solving multiple problems (pers. comm. de Haas, 2007).

'Architectural aspects of buildings'. Professionals should enhance creative processes. Common thinking, in fact, is dominated by pragmatism (pers. comm. Owehand, 2007). Unfortunately, a few of the creative representatives of the building and design sector are involved in redeveloping the existing (van Hal, 2008). Changes are difficult, but strength of ideas and convincement can make the difference (pers. comm. Sanders, 2007).

What is known from research is that people want to pay for improvements if interventions bring additional qualities to their living conditions (pers. comm. Ouwehand, 2007). If the façade is transformed to get lower energy bills then people would be happy (pers. comm. Wassenberg, 2007). Clearly, renovation should look nice (pers. comm. de Haas and Rainders, 2007) and be affordable. Factors affecting attractiveness of (social) housing should be considered in renovation, line preferences for housing types and architectural styles, neighbourhood image and location (pers. comm. Owehand, 2007). Market research on current demand is fundamental (pers. comm. Helleman, 20007). Need for appropriation of common space and social interactions are contextual factors that should be considered in renovation. Border conditions (inside-outside or private-public shift) and empty spaces should deserve more attention (pers. comm. Doepel, 2007). Sings in the living environment, like chairs at the end of the galleries, are good indicators to deduct requirements of people on usability and liveability spaces (pers. comm. Doepel, 2007).

Energy devices can be integrated in the existing envelope. This would emphasize the ecologic side of the renovation. Their visibility can be actually more important than the energy they produce and might support training people thinking and behaving sustainable (pers. comm. Bonet, 2007). Architectural integration of energy devices to get additional quality (pers. comm. Doepel, 2007) deserves more attention, for example, photovoltaic panels on existing façades. But this can be technically difficult and expensive (pers. comm. de Haas, 2007).

'Image of neighbourhoods'. The question should always be: for whom will the intervention be attractive? (pers. comm. Helleman, 2007). People, in fact, look at the visible features of the surroundings. Amongst the physical aspects, they look at the appearance, the built environment and neglect of buildings (Hortulanus, 1999 in van Beckhoven et al, 2005). Transformation of architectural appearance should deserve more attention when it can be strategically used to improve the image of the area (pers.

comm. Wassenberg, 2007). Innovative housing layouts could support developing landmark projects to attract people (pers. comm. Helleman, 2007), especially when making their characteristics visible from the outside. Emphasizing recognizability could serve promoting the restructuring of the area (pers. comm. Wassenberg, 2007 and Wassenberg, 2004). But every kind of creative solution should lay down in the local context and fit the market demand (pers. comm. Owehand, 2007). Exclusive transformations can be insufficient to attract higher income groups. Neighbourhood image and unfavourable location in fact, can strongly affect successfulness of the project (pers. comm. Wassenberg, 2007). Once an estate has acquired a problematic image, it might be very difficult to shed off this negative identity (Cole and Smith, 1996).

Housing differentiation deserves more attention. Adopting different and innovative housing types (floor plans, layouts, target group) can be effective because it is a strategy to insert a new product in that neighbourhood (pers. comm. Owehand, 2007). It can support the uniqueness side of the transformation. Visibility of changes can be also influential for the image of the area and the reputation of the housing association. But materialization deserves attention since people do not want things looking cheap (pers. comm. Bonet, 2007). However, the physical state and the architectural quality the envelope might not justify the transformation (pers. comm. Helleman, 2007).

'Implementation of renovation'. The experimental character of ambitious renovation should be avoided (pers. comm. Sanders, 2007). Spreading the knowledge gained from experimentations into the practice is still very difficult, especially when are introduced technical innovations (pers. comm. de Haas, 2007). Projects that sustainably innovate must be successful. With this respect, enthusiasm, made to measure and interdisciplinary cooperation proved to enlarge successfulness (van Hal, 2008). Ask the people, find solutions for future value and guarantee implementations are fundamental (pers. comm. Sanders, 2007).

Improvements of single blocks do not solve the problems on higher scales (pers. comm. Wassenberg, 2007). However, the housing associations might benefit from strategically mixing renovation approaches on neighbourhood level (pers. comm. Helleman and Hamers, 2007). Renovation projects that aim at combining different groups of people can be very difficult. It requires a lot of effort for the residents (rules of behaviour), therefore it should be carefully identified what interest can be shared and at what scale (pers. comm. Sanders, 2007). Arranging single buildings for compatible groups (pers. comm. Rainders and Hamers, 2007) might strength social relationships and liveability (pers. comm. Doepel, 2007). However, the conclusion from research is that people do not want to mix (pers. comm. Owehand and Rainders, 2007).

'Restrictions to renovation'. Renovation is considered the last resort when replacement can not be implemented due to contextual restrictions (pers. comm. Owehand, 2007). Common thinking supports the belief that only demolition solves existing problems, tackles with higher quality and is easier to be implemented since it does not imply dealing with sitting tenants (pers. comm. Owehand, 2007). Four are the major factors to go for demolition as mentioned by the housing associations: structural deficiencies, insufficient market demand, functional deficiencies and urban planning related motives (Thomsen and van der Flier, 2008). Subjectivity of decision makers is still very

influential (pers. Comm. pers. comm. Hamel and Scherer, 2007). In ambitious projects, the situation of the commission (sustainable credo, willingness to cooperate and room for negotiation) and the political agenda of the local municipality are also very important (pers. comm. Sanders, 2007). There are also place related factors to be considered: financial and housing market related motivations, popularity of the area, neighbourhood hierarchy, location and urban restrictions (pers. comm. Owehand, 2007). Resistance of residents, strong social relationships, value of people and attachment to the place should be carefully addressed (pers. comm. Sanders, 2007). Timing is a relevant factor. Less people will come back if the works would last longer than one year (pers. comm. Ouwehand, 2007). Innovations might slow down the whole process (pers. comm. de Haas, 2007), but every good idea can be implemented if it can be strategically sold (pers. comm. Ouwehand, 2007).

Technical quality of existing buildings can affect the renovation. Often, the bearing structure is calculated very strictly or the spans are vey limited therefore adaptations can be very expensive (pers. comm. Bonet and de Haas, 2007). It is very rare to see a completely new façade on a building with its own qualities or potential values for the future (like historical or architectural value) (pers. comm. Owehand, 2007). Therefore, searching for existing qualities can be an effective approach to effectively drive strategic renovations (pers. comm. Wassenberg, 2007).

4.2 Aspects based on an envelope strategy

'Sustainable transformation'. Strengths of profound envelope strategies like extreme make-over will be particularly necessary in the next future when quick, integral and preferences based renovations will be required (pers. comm. de Haas, 2007). Substitution of the old façade not only improves the (technical and functional) quality of the envelope, but can be a quick process especially when prefabricated technologies are adopted. A desirable situation is in the case of technical devices included within the new panels of the envelope (pers. comm. de Haas, 2007). If the process is properly managed, tenants might stay their dwellings during the works (pers. comm. de Haas, 2007). Making use of the existing frame is very sustainable because it limits the waste from demolition and recycles the existing bearing structure (pers. comm. Bonet, 2007). It is often the only solution to reach zero energy consumptions in existing buildings (pers. comm. de Haas, 2007).The major weaknesses of extreme makeover turned out to be the costs for its implementation. Therefore preservation of the existing structures wherever it is technically possible is crucial (pers. comm. Bonet, 2007). A reference could be the renovation of the Wallysblock in Rotterdam by Ineke Hulshof. The front side is preserved while the back façade is entirely substituted due to its critical conditions (pers. comm. Owehand, 2007). When the technical state of the facade is satisfying, adding insulation from the outside is the best option in terms of money, energy performances (pers. comm. de Haas, 2007) and appearance of exteriors (pers. comm. Bonet, 2007). To add value to the existing building, the design solutions applied to the envelope should also solve technical and functional problems (pers. comm. Wassenberg, 2007). But the location of the block is always crucial (Pers. Comm. Helleman and Owehand, 2007).

'Architectural aspects of buildings'. Strengths of profound envelope strategies like extreme makeover can be strategically employed in the creative part of the

redevelopment of a neighbourhood (pers. comm. Sanders, 2007). Among the weaknesses, there are preferences of the people. Since such approaches are very much based on improving attractiveness of the building, (architectural) preferences should be considered for example for housing types, architectural styles and materialization. For example, it recently emerged in the Netherlands that modern architecture is not that popular and retro architecture sells very well (pers. comm. Owehand, 2007). People might accept profound envelope strategies and might pay for them but only if they bring additional qualities in return (pers. comm. Ouwehand, 2007) like higher functionality or lowers energy bills (pers. comm. Wassenberg and Bonet, 2007). This is true especially when are adopted attractive façade solutions. For example, tenants would accept to pay for a restyling of the hall if it will improve the safety at the basement (pers. comm. Wassenberg, 2007). This is the case of the renovation of the Collective Housing by Doepel Joubert Strijkers Associates. The façade is profoundly transformed to attach a new architectural identity to the block and improve accessibility (pers. comm. Doepel, 2007).

'Image of neighbourhoods'. Strength of profound envelope strategies like extreme makeover is that they go absolutely together with neighbourhood branding (pers. comm. Sanders, 2007). Branding is very popular in the Netherlands and many housing associations are dealing with it but, despite in can drive the redesign of the neighbourhood, the reality is somehow different (pers. comm. Rainders, 2007). If the community is enthusiastic about ecological issues, then also sustainability can be a brand. A renovation in which new volumes are attached to an existing block to improve its distinctiveness and liveability within the dwellings is also branding (pers. comm. Rainders, 2007). Extreme make-over might function as an ‘icon making’ affecting the image of the neighbourhood (pers. comm. Helleman, 2007). Profound transformation of architectural appearance, in fact, could work as ‘image builder’ for the area (pers. comm. Helleman, 2007). Among the weak factors there is the location. Profound envelope strategies might better work in small neighbourhoods, with small blocks and in strategic locations like, for example, on spots emphasizing the entrance to the area (pers. comm. Wassenberg, 2007). Clearly, to get appealing envelopes enhancements should regard both exteriors and interiors that are relevant for improving market positions of dwellings (pers. comm. Rainders, 2007).

'Implementation of envelope strategies'. It seems there is room for the implementation of profound envelope strategies like extreme make-over (pers. comm. Helleman, 2007). Among the strengths there is the fact that they might be chosen by commissioning parties concerned with sustainable issues (pers. comm. Bonet, 2007). Because of their ambitious character, they might serve as generators for other projects, functioning as frontiers guiding further transformations (pers. comm. Rainders, 2007). In such approaches creativity has to be always very strategic. This means strategic and creative decisions on what physical solutions to be applied, who will implement them, what techniques will be used and where, timing of the process and future maintenance plans (pers. comm. Sanders, 2007). In principle, profound envelope strategies could work in attracting different groups but successfulness of the renovation could be affected by the size of the neighbourhood, its (bad) image or its competition with other areas (pers. comm. Wassenberg, 2007). A relevant weak factor is that here is not enough experience in managing ambitious renovation projects therefore implementation of profound

envelope strategies might be very difficult for the housing associations (pers. comm. Helleman, 2007). Their application might be successful under certain conditions like areas dominated by high levels of building repetition, on unfavourable location and in neighbourhoods with a bad image (pers. comm. Wassenberg). Therefore, they should be applied to selected buildings and on very strategic locations (pers. comm. de Haas, 2007). Reusing the existing frame might be efficient in terms of sustainability but the problem is a matter of costs (pers. comm. Wassenberg and Bonet, 2007). The financial situation of the housing association can be influential because adopting profound envelope strategies can be incredibly expensive (pers. comm. Sanders and Wassenberg, 2007). Due to the high costs for implementation, rents might raise with consequences on affordability for weaker groups (pers. comm. Rainders, 2007).

5 Conclusion and Further Research

Based on qualitative interviews to Dutch professionals, it emerged there are five major clusters of aspects that should be considered to design envelope directed strategies: sustainable transformation, architectural aspects of buildings, image of neighbourhoods, implementation of renovation and restrictions to renovation.

'Sustainable transformation' of existing housing is still very difficult because of the lack of knowledge on its implementation, the high costs and the time pressure due to the European energy targets. But rising awareness and stimulating motivation of the parties involved can help. Strategic are those renovations reaching the highest energy target and implementing a holistic sustainable concept. The challenge is to transform existing buildings in energy producers. The major advantage in adopting profound envelope strategies like extreme makeover is their sustainable, integral, preferences based and quick character. This is particularity true in the case of prefabricated technologies with the technical devices integrated in the panels. The costs are a relevant disadvantage but preserving those portions of the façade that are in good technical state can lead to a decrease of the expenses. Concerning 'architectural aspects of buildings', it appeared that the creative thinking process of the professionals is lacking. Innovations need strong ideas and a lot of convincement. The design of renovation should always provide additional qualities in return and affordable dwellings accommodating a demand. Making the attractive solutions applied on the façade visible from the outside and architecturally well integrated can be strategically used to emphasize the sustainable character of the renovation and contribute to add value to the building. Profound envelope strategies like extreme makeover could support the strategic redevelopment of a neighbourhood. But the design should fit architectural preferences of people (like shapes, styles, types).

To strategically enhance 'neighbourhoods' image', more attention should be given to the housing differentiation and the appearance of the blocks. Landmark renovations might be employed to attract people from outside and innovative housing types could emphasize distinctiveness of buildings. Place related circumstances, however, are crucial and especially the location. Since profound envelope strategies also aim at improving the initial appearance of the blocks, they might contribute to support the transformation of the bad image of a neighbourhood. But this can be very difficult. Envelope strategies would go together with neighbourhood branding but the reality in

less promising. They might better work in small neighbourhoods, with small blocks, and on strategic locations.

For what concerns the 'implementation of renovation', it emerged that ambitious projects are still experimental. The knowledge gained is not spread into the practice. Profound envelope strategies are not common in the Netherlands which might suggest there is room for improvements. Their implementation, however, can be complicated due to the lack of know-how, the relevant expenses required and the eventual move of residents during the works. The creative side of profound envelope strategies could be employed in strategic redevelopments of areas on unfavourable locations, with bad image and characterized by high repetition of buildings. To design the transformation of an existing block the housing market, the building quality, the presence of values for the future, the common thinking of professionals and the situation of the commission should be considered. Profound envelope strategies might better serve the purposes of commissioning parties concerned with sustainability. Also place related factors deserve attention like the popularity and the hierarchy of that area, its location, eventual urban restrictions and social circumstances. The size, the image, the location of that neighbourhood and its competition with other areas can be obstacles in those transformations that aim to attract different target groups. The careful identification of what interest can be shared and at what scale might be a solution.

To conclude this study, the remaining interviews need to be elaborated. Subsequently, triangulation is applied by using multiple sources of information from the theoretical background and the literature reviews of the research. After this phase, aspects to design envelope strategies are used to structure the matrix of solution and recommendations to answer the third research question

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Repositioning the Management of Urban Area Development in the Netherlands

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Abstract:
Dutch urban area development is faced with an increased influence of the private sector and a decreased influence of government bodies in decision-making processes. This results in a decreasing manageability of urban area development processes which leads to a change in the role and strategic conduct of the parties involved. Public and private parties are looking for new roles, responsibilities, and competencies in order to reposition the management of urban area projects, most profoundly expressed with the current interest in the concession model. This paper issues the ongoing influence of Anglo Saxon values over Rhineland ones in Dutch society and urban area development. The concession model as a possible new integral collaboration model in urban planning is the main subject of research.

Keywords:
Anglo Saxon model, Management, Public Private Partnership concession, Rhineland model, Urban Area Development

1 Introduction

This section contains several aspects about the nature and intentions this research. First, the context of Dutch urban area development in both the professional and academic way is outlined (1.1). Second, the hypothesis and conceptual framework of the research are presented (1.2). And finally, the outline of the research is described (1.3).

1.1 Professional and academic context

This PhD research started in February 2008. Before describing the actual research intentions it is necessary to position the research in two ways. The first positioning involves the professional domain of urban area development in the Netherlands. The term ‘urban area development’ first arose in 2004, during the process of formation of the Nota Ruimte (2006), a directive framework on spatial development of the Dutch Ministry of Housing, Spatial Planning and the Environment (De Zeeuw, 2007). It is the practical translation of the concept development planning. Urban area development combines urban planning with spatial investments and thus reinforces the implementation of urban planning. Urban area development now has become the

standard approach in Dutch urban planning. The second positioning involves the academic domain of this research, which is carried out at the chair of Urban Area Development, department of Real Estate & Housing, faculty of Architecture, Delft University of Technology. The chair's research objectives and methods are characterised by an integral approach of urban area development with an emphasis on the collaboration between public and private actors. This therefore also implies coordinating and integrating public and private interests, but also various scale levels, various phases in the development process, various urban functions, and various policy sectors and fields of expertise. This makes urban area development an integral task; it is to bring about coherence between the physically spatial, economic and social cultural aspects while considering the effects from an urban perspective. This PhD research focuses on the management of urban area development, with a specific focus on developing instruments to support the urban area development process.

1.2 Hypothesis and conceptual framework

Now we have clarified the professional and academic context of this research, we can describe the actual inducement of it. The hypothesis of this research is that there are recent changes in Dutch society and in urban area development, which causes changes in the positions of both public and private parties in daily practice. Changes that can be summarised in the conceptual framework presented in figure 1.

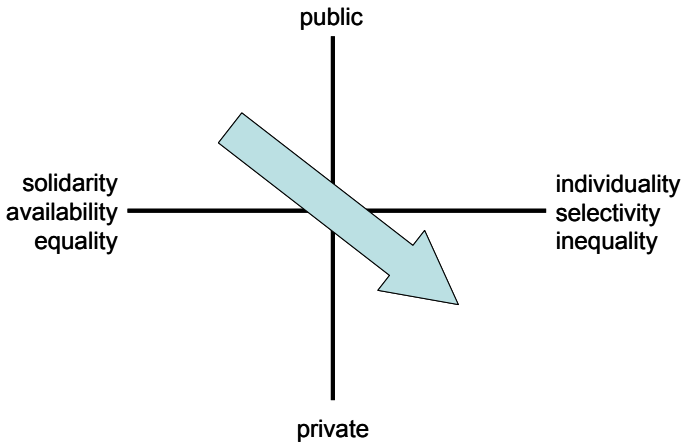

Figure 1. Conceptual framework; power shift in urban area development

The hypothesis is that there is a tendency towards more private (and less public) influence in decision-making on social and economic matters on the one hand, and an increased importance of individualism, selectivity in public facilities, and inequality in society on the other hand. Urban planning and especially urban area development are part of this changing societal context and are thus influenced by it. De Jonge (2007) describes this as follows: "In the second half of the 20th century the Dutch society has developed from a rather homogenous community with shared values and a strong influence of the central government in urban planning, to a society where individualism, consumentism and the private sector gain influence." In conceptual terms the shift can be translated as a growing importance of Anglo Saxon values over Rhineland values, which are nevertheless strongly founded in Western European continental countries like the Netherlands. In Dutch urban area development practice collaboration models –

mostly based on consensus principle of the so called ‘polder model’ – are strong organisational and juridical foundations for decision-making on, and realisation of, urban projects. However, we now see a rising interest in the ‘concession model’ as a possible alternative next to existing collaboration models. This model is characterised by a disconnection of tasks and competencies between the public and private sector, with a tendency towards more private sector dominance over the public sector during the whole urban area development process.

1.3 Outline of the research

This brings us to the main problem and objective of this research. The problem is that there is a knowledge gap on the possibilities and implications of the concession model approach for urban area development in the Netherlands. It is necessary from both the professional and academic perspective to find a solution for this problem, at the same time bridging the gap between theory and practice. Consequently, the objective of the research is to analyse the effects and consequences of an Anglo Saxon oriented approach on the values of a number of variables in urban area development.

The research design can be subdivided into five parts, briefly described here. The first and second part of the research are carried out in order to test and under scribe the hypothesis. The methodology consists of literature studies (both academic and professional) and interviews. The third part of the research is the analysis of effects and characteristics from an Anglo Saxon approach on the values of a number of variables in urban area development projects abroad. The methodology consists of case studies, carried out in the United Kingdom and United States of America. The fourth part is about the lessons learned from recent Dutch ‘concession like’ developments in order to seek for possibilities and difficulties within the domestic context. Methodology includes case studies and interviews as well. The fifth part builds upon the conclusions of part three and four and will ultimately result in an integral design of the concession model for urban area development practice and theory in the Netherlands. The methodology here consists of ex ante evaluation and design based modelling.

This paper will focus on the research results on hand at the end of September 2008, which includes the literature study and some conclusions from the interviews with professionals. Section 2 and 3 show that our hypothesis is grounded by literature, under scribed by most interviewees. These first findings support the necessity of further research on the possibilities and implications of the concession model approach for urban area development in the Netherlands. Both public and private parties, as well as citizens involved, can profit by a better understanding of the consequences of the Anglo Saxon approach and its application. Ultimately we expect this research to contribute to a viable integral design of a concession model for Dutch urban area development practice and theory. Generally speaking, it can reposition the management of urban area development in the Netherlands.

2 Literature Review

Both academic literature (2.1) and professional literature (2.2) reviews are necessary to under scribe the research hypothesis. The most important findings are presented here.

2.1 Academic literature

In the research design the academic literature review is the part in which the hypothesis of this research will be tested on a societal level. The main question here is; are there indications of an Anglo Saxon 'wind' influencing Dutch society and particular professional domains? Brouwer and Moerman (2005) are searching for the reason behind the apparently unstoppable march of Anglo Saxon thinking in our West European society in recent years. Further more, they try to identify the similarities and differences between the Anglo Saxon and Rhineland approach. In his book 'Capitalism versus Capitalism', Albert (1993) made a first separation between Anglo Saxon and Rhineland approaches. On the one hand, Anglo Saxon countries are not in the first place English speaking nations. In that respect the definition of Anglo Saxon is too broad. Socio-economic systems in countries like Canada, Australia and New Zealand are too different from Anglo Saxon principles like the short term financial revenue culture. Thus, he states that the United Kingdom and the United States of America are the purely Anglo Saxon countries. Those countries will be analysed in this particular research. On the other hand, Rhineland countries are geographically speaking not only connected to the Rhine River. Germany can be seen as the cradle of the Rhineland approach, where values like collective success, consensus, and care for the long term are basic principles. In other countries like The Netherlands, Switzerland, Denmark, Sweden, Norway, France and even Japan, these basic principles are rooted in society as well, though in other context dependent relations. Ultimately, it can be said that Rhineland and Anglo Saxon conceptions are fundamentally different towards the arrangement of the state. On this matter Albert (1993) speaks of the battle between two types of capitalism. Brouwer and Moerman (2005) point out that the main difference between both approaches lies in the economic domain, the role of governments, and economic science. The Anglo Saxon principle of the free market stands opposite the Rhineland principle of a certain regulation of the financial market by the government.

In the Netherlands we can distinguish some privatisations of government service bodies (like the Dutch railway company and energy suppliers) since the 1980's. Central government bodies decided to dispose some functions in favour of the free market economy, at the same time they are still in control of other public facilities like the social health care and educational system. So, speaking on a socio-economic level the state interference in the Netherlands nowadays is still present at some domains and not present at other domains, but Anglo Saxon influences on the free market are increasing. Godijk (2008) further argues that there is an almost unnoticed Anglo Saxon Western wind that dropped in the domain of corporate governance. Examples of this are the composition of share capital, boards, firm cultures, and human resource instruments of stock market quotated companies. Here we see a tendency towards adapting Anglo Saxon principles in favour of the Rhineland variant, mostly primarily defined as the increased influence of shareholders over stakeholders. In addition to this, Brouwer and Moerman (2005) speak of emerging differences of attitudes in the relations between organisations. Organisations function within an increasing dynamic world where interactive relational ways of working between organisations is of vital importance to survive. They distinguish different priorities for three dimensions (juridical, organisational, and relational) based on different concepts of thinking. Rhineland organisations prioritise organisational over relational and juridical dimensions in their industrial system of capitalism. Anglo Saxon organisations prioritise juridical over

organisational and relational dimensions in their financial system of capitalism. In addition to this matter, in the Netherlands recently (from 2000 onwards) there is a profound wish of decreasing country wide regulations in favour of more case based juridical solutions. Here we can distinguish an increasing call for the Anglo Saxon juridical principles of case or common law in favour of the Rhineland civil law, or, to put it another way, 'less government and less administrative pressure' (Van de Klundert, 2008). Though, civil law is deeply rooted and unlikely to disappear in the Dutch state system, this example also is a sign of the Anglo Saxon wind in society. In general we can state that our hypothesis of an increasing influence of Anglo Saxon principles is present in different domains of Dutch society. Table 1 gives a summary of the main differences between Anglo Saxon and Rhineland concepts found in the literature above.

Table 1. Differences between Rhineland and Anglo Saxon concepts

Concepts	Rhineland model	Anglo Saxon model
Economy	Market regulation	Free market
Relation priorities	Organisational Relational Juridical	Juridical Organisational Relational
Legislation	Civil Law	Case / Common Law
Leadership & individual skills	Self management	Hierarchical management
Management	Strategy & flexibility	Planning & control
Decision making	Consensus (debating)	Negotiation (gaming)
Influence public sector	Strong	Weak
Influence private sector	Weak	Strong

2.2 Professional literature

The hypothesis on the presence of an Anglo Saxon Western wind in the domain of urban area development is being tested by professional literature reviews. The main reason behind shifting positions of the public and private sector is the phenomenon of complexity. During the past decade in the Netherlands, parties involved with urban area development projects are faced with changes in the way urban land use plans are made and decisions relating to them are reached. Changes which various authors (Van Loon, 1998; Teisman, 1998; Wigmans, 1998) in the field in of decision-making in urban area development processes relate to more structural societal changes, which are connected to an increasing complexity of societal decision-making and an enlargement of the social and economic dynamics in our highly-developed society Because of ideological, cultural and financial reasons there is less space for hierarchical management and more space for condition creating network management. As we are not primarily interested in the reasons behind the phenomenon of complexity in this research we now move to effects of it urban area development practice.

The above described changes result in a decreasing manageability of urban area development processes which leads to a change in the role and strategic conduct of the parties involved. On this matter we can speak of the rise of the development planning,

which forms an active counterpart of the classical 'traditional approach' of urban development which is characterised by a sequentiality of public and private conduct. In development planning there is an early and intensive collaboration between local authorities and the private sector about the content and process of an urban area development (Van Loon c.s., 2008). Urban area development is the practical application of this development planning; it combines urban planning with spatial investments and thus reinforces the implementation of urban planning (De Zeeuw, 2007). On a national scale the Dutch Ministry of Housing, Spatial Planning and the Environment published a directive policy document called the Nota Ruimte (2006) which contains recommendations for applying development planning in practice through urban area development. Important recommendations include more influence and mandatory of local public authorities and less central government interruptions. Recently, another study on the position of public and private parties and management of urban area development processes conducted by the parliamentarian Commission 'Fundamentele Verkenning Bouw (2008) concluded that now it is time for the private sector to manage urban area developments more frequently and in an integral way. Thus, we can distinguish a power shift from national to local public authorities and a shift from local public authorities to the private sector in a relatively short period of time.

The main reason behind the request from the commission is the wish for a 'faster and smarter' urban area development process. If we put this request in another way, there is a rising discomfort about current collaboration models, and especially the Public Private Partnerships like the 'joint venture model'. As Van de Klundert (2008) puts it, 'Public Private Partnerships represented and reflected a certain period in time, but now we are in a planning culture that is in transition.' We are facing new approaches on collaboration and management of urban area development. The time that both public and private parties worked together on designing and realising plans for an urban area – in a legal organisational body sharing responsibilities and competencies with the intention to spread financial risks on the investments and spreading revenues on land development and real estate exploitation – is subject to change. As a practical result we now face a period of an experimental kind. The Commission recommended that the urban area development domain should search for alternative instruments for collaboration. One collaboration model in specific was mentioned, the concession model. A definition of the concession model, as described by Habiforum (in Deloitte, 2008), is as follows:

A land development concession is an instrument which enables public parties to enter into an agreement with a private party or a consortium of (private) parties to (re)develop, construct and maintain an area. On the basis of an agreed spatial development plan the private parties are held responsible for the quality, construction and maintenance of the area for a limited period (20-30 years).

This still doesn't reflect the characteristics of the concession, for this research however it will be necessary to be very clear about the definition. The first 'real concession' in terms of the definition above will probably be applied to the urban area project Ooijen Wansum, which will be recommended by the actors involved as the real life experiment asked for by the commission Dekker. This still has to be approved by the Dutch government, but a study by Twynstra Gudde (2008) on the juridical and legislative possibilities points out that there are indications for a serious experiment with the new

collaboration model. For example, this report concluded with an optional intention agreement between the public and private parties, within the constraints of present Dutch laws. In recent practice, private developers together with local authorities already initiated ‘concession like’ projects on several occasions. Mortiere Middelburg, Oud Ijmuiden, Ooijen-Wansum are some of the practical examples of ‘concession like’ models in the Netherlands from past years. These cases will be subject to analysis further on in the research, in order to learn from these early examples of variants on the concession model and start at as appropriate.

3 Research Methodology

The research design can be subdivided into five parts as visually summarised in figure 2. For each part we will discuss the main content, considerations and limitations of the research methodology.

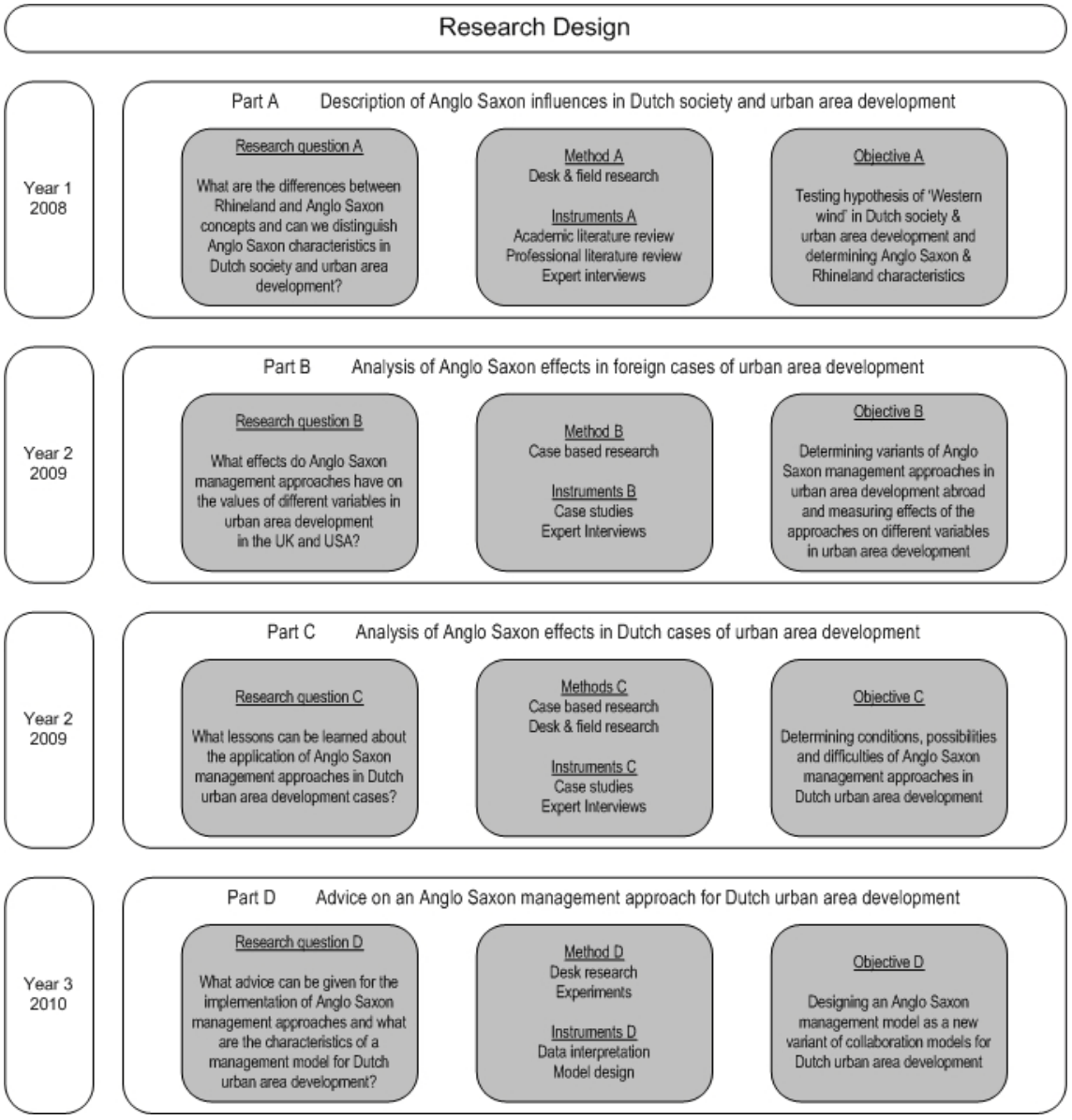

Figure 2. Research Design

Part A and B of the research design are carried out in order to test and under scribe the hypothesis of an increasing influence of Anglo Saxon concepts in Dutch society and an increasing influence of the private sector in urban area development. The methodology consists of literature studies and interviews. Relevant changes on a societal level are supported by academic literature, and changes on a practical level are supported by findings from professional literature, interviews with professionals, and some current empirical project examples. There have been considerations if it would be necessary to analyse Anglo Saxon influences outside the domain of urban area development. But, considered the political and socio-economic context of which urban area development is a part, this might result in the social and probably academic irrelevance of the research. The Dutch urban area development equivalent of the Anglo Saxon approach is considered to be the concession model, as it is already being adopted in both the academic and professional literature and jargon. Before we continue to part C of the

research therefore we have to make our own clear definition of the concession model in order to select cases that answer the characteristics of the concession model.

Part C of the research design is the analysis of effects and characteristics from an Anglo Saxon ‘concession like’ approach on the values of a number of variables in urban area development projects abroad. The methodology consists of case based research, carried out in particular selected urban projects in the United Kingdom and United States of America. In specific, involved public and private actors are interviewed, documents are analysed, and practical results are measured in order to learn lessons about the possibilities and difficulties of the Anglo Saxon approach in a foreign context. There have been considerations on selecting other countries surrounding the Netherlands, most particularly France and Germany, in order to learn lessons from their approaches on possible Anglo Saxon influences on urban area development. However, this is not directly of assistance to the research objective. We are looking for effects and consequences of purely Anglo Saxon approaches in their native context in the first place and further on will analyse Anglo Saxon approaches in cases within the Dutch Rhineland context. There is a preference for an in dept research, so we limit ourselves to the UK and USA for conducting case studies. Furthermore, we are aware that choices have to be made on the criteria for selecting cases, on the selection of variables, and the way to measure them, as well as difficulties to cope with context dependent circumstances.

Part D is about the lessons learned from recent Dutch ‘concession like’ developments in order to analyse possibilities and difficulties in the domestic context. Methodology includes case studies and interviews. After part B and C is completed it will be possible to determine whether or not a specific Dutch case can be considered a concession, on basis of both the definition of the concession model and the additional characteristics found in cases abroad. For the definition of the concession model the scope, scale, and nature of the urban project itself is considered to be of importance. Here, opinions from interviewed professionals will support the description of possibilities and difficulties.

Part E builds upon the conclusions of part C and D and will ultimately result in an integral design for the implication and application of the concession model for urban area development practice and theory in the Netherlands. The methodology here consists of ex ante evaluation. How exactly this final part of the research will look like is not clear at this moment, but the intention is that there will be given fundamental thought on the possibilities and difficulties of applying a concession model within the framework of legislative, juridical, and organisational context in the Netherlands. However the main focus of the research will be the integral design of the concession instrument itself as an adequate variant of collaboration models for urban area development. In a broader sense this integral advice and design has to contribute to the repositioning of the management of urban area development.

4 Findings and Discussion

Both from the academic as well as the professional literature review we can conclude that there is an Anglo Saxon wind in both Dutch society and urban area development. Most profoundly to be mentioned is the increasing interest in the concession model as a

possible future variant on current collaboration models in urban area development. Though we may notice a different approach in the years to come – evidently since the Second World War the Netherlands have faced an alternate power shift between public and private sector – at the moment our hypothesis is confirmed.

To refine these literature findings 8 professionals from urban area development practice have been interviewed during the summer of 2008 by the PhD candidate. Objective of this method was to test the hypothesis with an open interview technique. On the one hand, all professionals under scribed the increased influence of the private sector in urban area development. On the other hand, the majority of the interviewed professionals indicated that the assumption that urban area development is becoming more individual and in equal is not that relevant for this particular research, it even is not that obvious, it is a concern of all times. For that the interdependencies between parties are to strong. Urban areas are hard to develop without interests and means form all parties. Relationships and agreements are made with the objective to create an added value. Not one party can claim dominance in urban area development; all parties have different instruments to manage the outcome of it. Here we arrive at the main issue discussed with the professionals. Parties involved in urban area projects have troubles defining their actual role. Who is in charge and under what circumstances and conditions, and on which matters is one judged, and with what instruments? Both public and private professionals addressed the concession model as an instrument for collaboration between public and private parties with potential to solve this problem.

5 Conclusion and Further Research

We started this research with a conceptual framework about changes in urban area development. The most important findings of the research so far include the confirmation of a current Anglo Saxon Western wind in Dutch society, as is mentioned in socio-economic and corporate academic literature. Furthermore, professional literature, opinions of professionals, and the current professional interest and pioneering in urban projects with the concession model indicates that private parties have an increased influence in urban area development. For this research it means that the ultimate integral design of the concession model has to answer current problems on management of urban area development, especially on responsibilities, tasks, competencies of parties. For this we need to analyse the Anglo Saxon approaches of actors abroad, in order to translate these approaches to our own specific Dutch context. Next step in this research is to describe what the characteristics of the concession model are in order to select cases on the basis of this definition. In these cases attention is paid to the effects of the approach on several variables of urban area development including; management, costs and revenues, procedures, contracts and agreements, instruments, spatial qualities, scheduling and planning, and so on. Both qualitative and quantitative variables have to be measured using a predefined scale. We conclude with the contribution and relevance of this research. In Dutch urban area development practice this research has potential to provide a handhold for managing urban area development in the shape of a new collaboration model in addition to current used models. For the academic field this research is a clear example of applied research in urban area

development, it tackles socio-economic issues on an operational level. It aims at finding a solution for managerial problems in this particular field of expertise on the basis of an integral approach instead of the (existing) domain specific

6 Acknowledgement

For both their fundamental and creative contributions to the formation of this research I would like to thank my daily supervisor Dr. Mr. Fred Hobma and promoter Prof. Ir. Hans de Jonge. Furthermore I would like to thank all interviewed professionals who helped me with interesting tips and gave me a broader and deeper understanding of urban area development practice in the Netherlands.

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Do Courtyard Houses Provide the Ideal Climatic Solution in Hot Climate Regions? Case study- Tripoli, Libya

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Abstract:
The courtyard house is a fundamental traditional structure in the Mediterranean and hot climatic regions. Despite the general understanding that the courtyard house is the appropriate solution to the hot climate region; several studies have indicated that such approach has not been adapted in contemporary architecture. In this light, this paper aims to investigate the reasons for the underlying reluctance to the use of the courtyard in contemporary architecture and answering the question of whether the courtyard house was the main climatic solution in hot climate region, or it is a result of other climatic, social and religion solution. The findings will provide architects, students and end-users with a better understanding of potential design strategies for using the courtyard concept and its relation to climate. To achieve the aim, the research adopts the triangulation approach to reduce the biases inherent in the case study strategy. An observation of traditional building and a field survey are applied to understand the professional's opinion and end-users' satisfaction of their building in contemporary and local architecture in Tripoli – Libya, as well as measuring indoor temperature in traditional courtyard house (open and covered courtyard) and contemporary houses. Photos and drawings from traditional houses in Tripoli were used to examine the ways in which the people solved their comfort housing needs in the design of the courtyard house.

Keywords:
Climate, Courtyard house, Traditional architecture, Tripoli Libya

1 Introduction

Courtyard houses have been used by many urban civilizations for hundreds of years. It is still the traditional house type of many Asian, North African, South American and European countries. Fathy(1986) stated that the courtyard concept is universally applied in both rural and urban housing design in the traditional architecture of countries in hot arid regions stretching from Iran in the East to the shores of the Atlantic Ocean in the West. The nature of the courtyard as a space seems to be well defined as an open space that is surrounded on all sides by buildings. Its design is slightly different in its details from one country to another, but the main concept of design remains the same. The courtyard has become a flexible space where most of the activities of the family happen. It provides security and privacy for the residents and daylight for the rooms that were built around them. Usually it includes planting trees and a shallow pool in the middle of

the yard. Edrees (2001) cited by Amer (2007) added that the courtyard is a space for family gathering after sunset, where the family members enjoy cheerful social interchange in comparatively fresh and cool air. Theories have confirmed that there is a strong relationship between the courtyard and sustainability, Edward et al. (2006: 222) defined This relation as "the courtyard house is a model of low-energy design, of built form which supports rather than destroys family and community life, and is a unit which creates the essential building blocks for making of sustainable cities". From the assessment of the survey studies and the observation of the case studies, the paper is aimed to achieve the following:

- Identify behavioural patterns in tradition houses;
- Evaluate to what extend the courtyard houses still meets people's housing needs;
- Study a model that can be produced from which the form can be updated and made relevant to modern society.

2 The courtyard house concept design

The courtyard is defined by the Oxford English dictionary (2000:156) as "an area of ground, without roof, that has walls or building around it, for example in a castle or between houses or flats". The concept of the courtyard house is dependent on the enclosed space being open to the sky and surrounded by rooms on all sides. The courtyard is slightly different in its details from one country to another, but the main concept of design remains the same, as well as the building materials and the low height. It is characterised by being inward looking and with a few high outside windows to respect socio-cultural traditions as well as to suit the climatic conditions.

2.1 The courtyard house and climate

Many studies have been conducted on the performance of the traditional courtyard house in modifying climate. For instant, Swan (1991) in his study of Hassan Fathy stated that the central courtyard of a house is the most efficient air conditioner for it traps the cold of desert night air, releasing it gradually during the day to adjoining rooms through in-built cluster. Edwards et al. (2006) confirmed that courtyard provides a climatically controlled space from many of nature's unwanted forces, such as wind and storms. El-Fortia (1989) stated that there are two important aspects of the courtyard, it modifies the climate of the living spaces and provides light and air to the rooms, also it plays a main role in the social life of the family.

Bukamur (1985) clarified that the courtyard house, in addition to it's flexibility of orientation, are well protected from the hot, sandy winds and outside air pollution. Gianni (1988) explained that the Arab courtyard house considered as an example diffused in many variations through Arabic and Islamic countries. It creates a complex regulating system that creates a microclimate in a passive way where heat transfer processing naturally. In this sense, the courtyard house is the end product of a complicated historical procedure of unconscious climatic design. In more details Evans (1980) stated that the rooms are built around the central courtyard, which provides a relatively cool private out-door space for family activities. To increase the ventilation inside the house, and reduce the temperature, the height of ceiling is usually increased to 4m. This feature is associated with housing in hot climates, providing openings at the

top that help the hot air ascend and escape. Rajapaksha et al. (2003) clarified that in order to minimise indoor overheating conditions the inclusion of an internal courtyard in building design should be qualified to the optimization of natural ventilation. However, the efficiency of this strategy greatly depends on the design details of the building composition in providing appropriate airflow pattern to the courtyard. Safarzadeh et al (2005) and Fathy (1986) added to the above features that, the courtyards provided security and privacy for the residents and daylight for the rooms and basements which were built around them. Also they provided other benefits in the hot climates; with their tall walls, the rooms (built around the courtyard) provided wind shading effects for one another, thus reducing the infiltration of hot and often dusty winds to the rooms. With their trees, flowers, shrubs and a pool of water, the courtyards created a micro-environment, a few degrees lower in air temperature and slightly higher in relative humidity. Furthermore, the tall trees in the courtyards shaded the walls and the ground from the intense direct solar radiation of summer. All these features reduced the heat gains of the building.

Despite the huge belief of the specialist and professional architects that the courtyard house is the ideal solution for achieving thermal comfort in the hot climate regions, some authors argue that the success of the courtyard depends on the integration of other factors. For instance, The Center for Desert Architecture and Urban Planning (CDAUP, 2008), stated that conclusions of a number of studies have indicated that the internal courtyards, as thermal modifiers in the built environment of hot regions are not necessarily right. They suggest the success of such courtyards in creating a good microclimate depends to a great extent on their detailed design, requiring careful attention to a range of factors including geometry, finish materials, and the use of vegetation.

The importance of studying and searching for the benefits of the vernacular architecture especially the courtyard house typology has been clarified by many others, for instance, Gianni (1988) mentioned that “very little quantitative work has been done to understand the thermal behaviour of the courtyard typology as a system in different climates and cultures”. Fathy (1986) stated that new science can develop human abilities to use natural sources of energy which can be achieved in vernacular architecture. He argued that if science and technology are to regenerate architecture through a logical and comprehensive comparison of new and traditional structures, the principles that created the solutions must be respected. This is the only way to improve human and ecological quality whilst also retaining the achievements of traditional architecture in the hot regions of the world. El-Fortea (1989, 110) wrote that “it would not be unreasonable to consider that a form of housing that has been adaptable to the changing need of people through many centuries could not be adapted yet again to meet the requirements of today’s society and its new lifestyle, at the same time giving a sense of identity and continuity.” And finally Edwards et, al. (2006, 231,22) argued that climate is not the underlying reason for the courtyard house and gave an example of Milan and Aleppo that they share the same building type but not climate. However, he stated that “The courtyard is after all a tradition which over the past century has come under three great threats -war, earthquake and globalization- yet remains vibrant and relevant”. He confirmed that the traditional courtyard house was the invention of many different influences, and set six functions of the courtyard as follows:

- The demarcation of limits of the property;
- The definition of a place of privacy for the family;
- The unification of spaces and elements in a house;
- The provision of circulation elements;
- The creation of a garden or cool place;
- The promotion of ventilation.

2.2 Principle of the courtyard

There have been many studies conducted on courtyard housing with each giving a detailed explanation about its importance and principles (Amer, 2007, Edwards et al. 2006, Muhaien, 2006, Cofaigh et al, 1996, Roaf et al., 2007, Fathy, 1986, Golany, 1980). Depending on the fact that, in hot zones, air temperature drops considerably after sunset from re-radiation to the night sky. Hassan Fathy(1986) as a pioneer in this field explained in his book "Natural Energy and Vernacular Architecture" how the cooling system used in a courtyard house works and how convection currents generate a flow of air. It is dependent on the idea of air movement by convection, where warm air is less dense than cool air and therefore will rise in an environment of cool air. As the warm air rises, it must be replaced by cooler air from the surroundings. Fathy divided the air movement processes inside the courtyard into three cycles as follow;

The first cycle depends on the cool night air falling in to the courtyard to replace the warm air that rises to escape outside the house. This cool air gathers in the courtyard in laminar layers and seeps into the surrounding rooms, cooling them. This coolness is effective until noontime, fig. (1).

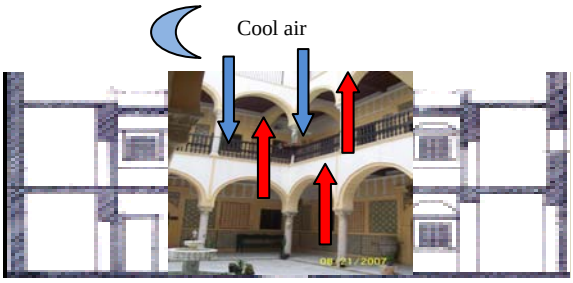


Fig.(1) The first cycle of the air movement

The second cycle happens in the morning when the air of the courtyard, which shaded by the surrounding rooms, and the cool air stored in the rooms at night, filters out to the courtyard which heats slowly and remains cool until late in the day when the sun shines directly into the courtyard. Fig. (2)

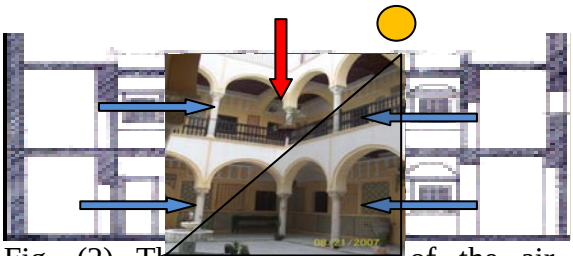


Fig. (2) The second cycle of the air movement

The third cycle starts when the sun's rays fall vertically on the courtyard, the warm air begins to rise up where it is replaced with the cooler air, this cycle continues into the night until the first cycle starts again. Fig (3)

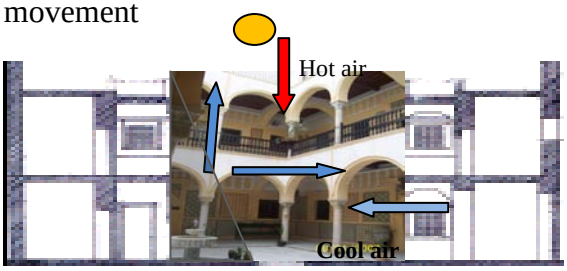


Fig. (3) The third cycle of the air movement inside the courtyard.

Amer (2007) stated that the courtyard as an architectural element was functionally based on aspect of the climate, demonstrating its suitability for the hot weather, because it helped in circulate the air and stimulate the required air currents, he concluded the main two functions of the courtyard in relation to climatic condition are;

- During day time, the courtyard is cool because of the shade offered by the walls and surrounding houses.
- During the night, the courtyard is also cool because of the cold air layers on the floor.

3 The case study -Tripoli

3.1 Location and climate

Tripoli is located in Libya in the Mediterranean Sea. Geographically situated to the north of the Equator, at longitude 32.56 degree, and latitude 13.15 degrees east of Greenwich as shown in Figure (4) (Amer, 2007). The weather in the Mediterranean and semi Mediterranean Sea (coastal region) is characterised as hot and humid in the summer season and warm and rainy in the winter season (Shawesh, 2000). The average humidity in this region is 58% to 65%, which in some years may increase in the summer June to the end of August (Emhemed, 2005). Contrastingly, Amer (2007) stated that the costal regions are characterised by cold, wet winters, and hot, dry summers.

The average temperature in Tripoli ranges from 30ºC in summer to 8ºC in winter and in the desert summer temperatures rise to over 50°C, but daytime winter temperatures range between 15 and 20°C, falling below zero at night (Arab.net 2002). Table (1) shows the average temperature in Tripoli during a ten year period from 1995 to 2005. According to Alfenadi (2007) and Bukamur (1985) El-Azizia city which is located 55 km south-east of Tripoli, recorded the hottest maximum shade temperature recorded on the face of the Earth (58°C) recorded on 13th September 1922

Fig.(4)Location of the case study -Tripoli www.worldsurface.com/images/maps/libya

Table (1) shows the average lower temperature in Tripoli during ten years.

Source: National Centre for Meteorology - Tripoli station

Years	Jan	Feb.	Mar.	April	May	Jun	July	Aug.	Sep.	Oct.	Nov.	Dec.
1995	7.2	10.5	12.2	13.1	17.7	22.1	23.5	25.3	24	18.2	14	11.8
1996	11.4	10	12.5	14.8	18.2	20.8	23.4	25.3	24	17.5	14.5	12.2
1997	10.8	10.2	11.2	13.8	18.1	24.8	24.8	25.2	22.7	19.7	14.7	10.9
1998	9.6	10.7	10.9	15.8	18.1	22.5	23.2	24.2	23.4	20.3	13.2	10.5
1999	10.9	8.7	12.7	14.8	19.9	24.2	23.8	26.5	24.6	21.7	15.9	10.8
2000	7.8	9.6	12.2	16.1	20.3	21	23.5	23.4	23.4	19.4	15.2	12.1
2001	10.5	10.2	14.5	14.7	19.9	20.7	22.9	24	24.4	21.1	16.5	11.1
2002	8.5	10.9	14.5	15.5	19.2	20.8	25.4	25.5	23.5	18.6	15.3	10.8
2003	10.5	9.3	11	15.3	18.9	22.7	26.4	25.5	24.4	22.8	16.7	11.3
2004	9.8	11.8	13.2	15.7	18	21.5	23.4	25.5	22.1	21.1	15	9.8
2005	7.9	6.2	11.4	12.6	16	19.4	22.8	23.3	22.8	18.9	13.4	9.3

The prevailing winds in the costal strip are from the north and become less and less dominant as the distance from the sea increases, the wind speed in Tripoli can reach 30-35 knots in winter (El Fortea, 1989). Amer (2007) added that this area in July and August is affected for many days by a south wind (Ghibli) which raises the temperature in this region. The annual average rainfall in the plain coastal region reaches 300-400mm though it sometimes exceeds 650mm or falls to less than 200mm in the driest years (Al-Maulode, 1993, cited in Emhemed, 2005)

3.2 The Characteristics of the old City Form

Daza (1982) stated that Tripoli old city reflects a strong and clear picture with simplicity of means in every neighborhood where the geometrical combination of the building is simple and clear. Azzouz (2000) added that the consideration of climate, customs and traditions were major factors in shaping this city (Figure, 5), and Shawesh (2000) believes that the location of the old city and its relation to the sea are the keys to its long life and determine its character. The old city is compact in its pattern where the houses are surrounded by three neighboring houses to decrease the area of walls exposed to heat (Figure, 6). Its scheme follows no superimposed grid system; it gives an obvious example of organic growth. The streets are usually narrow, twisted, with surprise changes and slight curves. The widths of streets or alleys are only 2 to 3 metres.

Most streets include flying buttresses (arches) between the opposite walls of the houses and street elevations, the function of these arches is not only to brace and support the houses but also helps to provide more shade and breaks the street length (Figure, 7) also there is another feature which plays the same role of the flying buttress are the projection rooms (Figure, 8). The system of streets is hierarchical in its design and planning according to its function and width. These features of the streets helps in providing shaded areas, good ventilation and a cool atmosphere, also they provide a suitable place for people's daily life. Another significant feature in the formation of the old city is the open spaces where the city becomes a place of court yards.

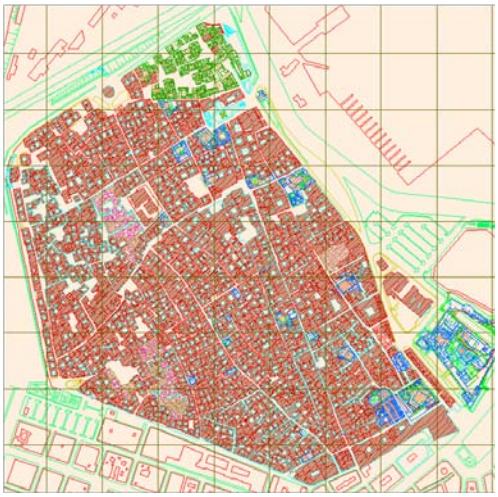
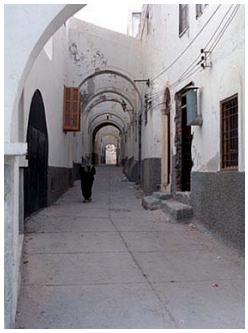


Figure (5) Map of Tripoli old city source : the institute of development and maintenance the old city

The same author classified the open space in the old city according to (the size, location and use in term of degree of privacy) into four types; private space (house courtyard), semi-private open space, semi-public space and public space. The principles shaping the old city help to minimise the thermal load on the building envelope and provide comfortable conditions even in the summer time.

Figure (6) the compact city www.google/libya/images.



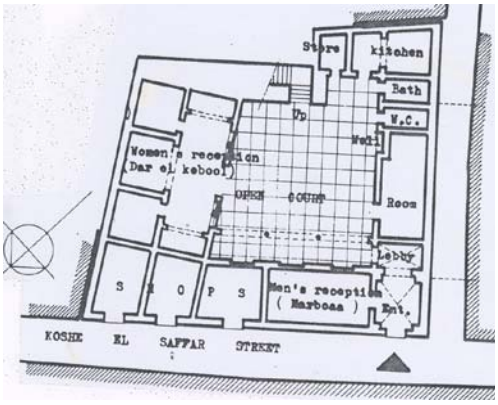
(Figure, 7) the flying buttresses. ; the author

(Figure, 8) the Projection room. ; the author

3.3 Tripoli courtyard house

Most houses are attached on two or three sides with the majority of houses consisting of two stories usually built around a regular courtyard, single story houses also exist. Houses consist of a number of narrow, rectangular rooms, bathrooms, a kitchen, and one or two guest rooms, all oriented towards the open courtyard as shown in figure (9). The average area of these houses is around 300 square metres, and the courtyard ranges in size from 70 to 100 square metres and the shape of courtyard may be rectangular or square (Amer, 2007). The dimintions of the courtyard vary; it can range in size from (3 x 4) m to (8 x 10) m (Eldweeb, 2005) they are usually in proportion to the height of the building to provide enough shade for most of the summer day.

The environment within the courtyard is also regulated for different functions at different times of the day and of the year. The houses are inward looking towards the courtyard, with rooms depending on the courtyard for almost all light and air circulation, sometimes in conjunction with small high-level slit-like openings in the external wall. In the second floor the windows are generally large but obscured by mushrabiya to maintain the privacy and let light and airflow in the house. To reduce the effects of heat and glare on the home and its occupants the courtyard might have trees, water pools and/or wells and awnings.



Figure(9) traditional two story courtyard house ; Almansuri (2000)

Rooms are further protected from the rays of the sun by the building of a loggia (arcades) along one or more sides of the courtyard figure (10). The courtyard is usually entered from one corner through a veranda, the upper floor has a similar veranda with arches surrounding the courtyard to provide access in to the rooms on the first floor.

The interior layout of the house was essentially designed to maintain privacy of the female members of the family from the view of male visitors.

Fig. (10) Typical courtyard house. ; the author

3.3.1 Social Function of the courtyard

The effect of religion and social interaction on local architecture can be observed in two ways. Islamic religious teaching encourages privacy and modesty, and courtyard houses fulfilled this condition by providing an inward-looking house. In addition to the climatic functions of the courtyard, it serves many other functions summarised by Amer (2007) as follows:

1- Providing ventilation and air movement to cool rooms.
2- Providing natural light and shaded areas.
3- Providing privacy.
4- Providing a quiet place that offers good protection against the passage of heat and the street noise.
5- Providing a space for family gathering after sunset. It is also used as area for activities during wedding and meeting friends.
6- Providing an ideally safe area for babies and children to play in, where their mother can easily watch them.

3.4 Construction methods and Building materials

Traditional house design in Libya depended on the natural resources available locally for building materials. All the construction materials such as limestone, sand, stone,

mud and sun dried brick were locally available and used in walls (more than 70cm thickness). In the roof they used plants such as palm-tree trunks (used as beams with maximum length of 2.4m), pine timber joists, palm tree stems and fine concrete earth or mud. These types of building materials restrict the height, width and shape of housing. These constraints also gave traditional houses in Tripoli a sense of consistency in their scale, height, width and external shape (Almansuri, 2000).

El-Fortea (1989) described that the walls and roof in traditional buildings were made of very thick material, with the roof covered by a mortar layer followed by a layer of mud, and both constructed from local materials that offered a high degree of resistance to the heat such as limestone. The other way to respond to heat is by painting the roof and external surfaces in white which reflects solar radiation.

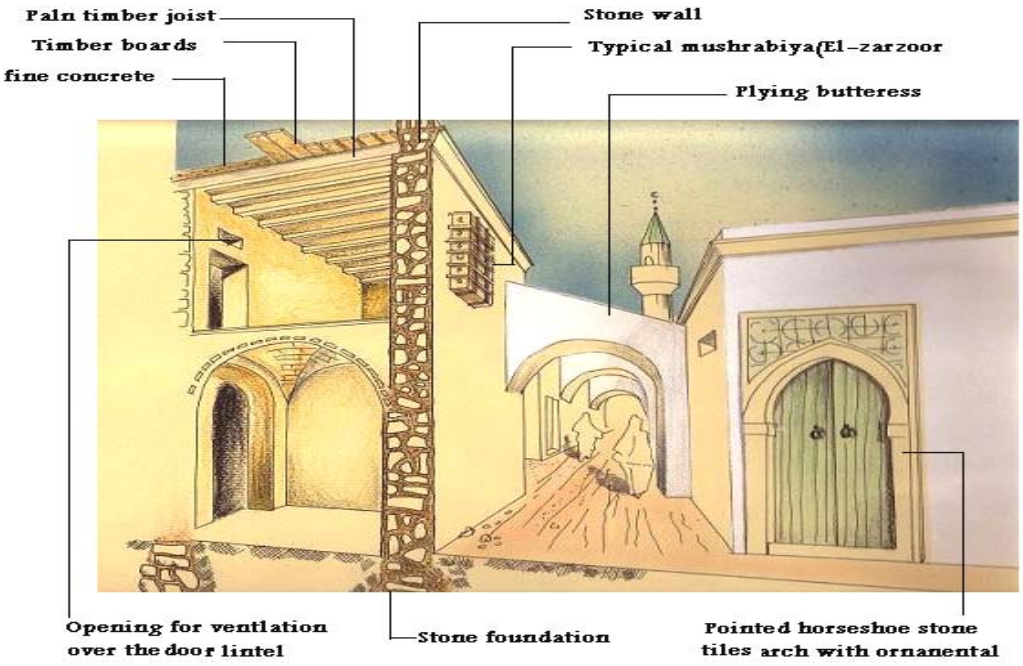


Figure (11) a cross-section of alley and building materials in traditional city of Tripoli : Amer (2007)

3.5 Thermal Performance of traditional courtyard houses

To achieve optimum comfort and energy savings the building envelope should integrate design of building form and materials as a total system including the way they operate towards heat transference through them and modify the internal climate of the building in reaction to the external climate. For Tripoli courtyard houses, the effects of high temperatures and extreme solar radiation as well as high humidity during some days in the summer time extreme cold and rainfall in the winter are the most clear climate conditions that affect their interior design.

4 Research Methodology

According to Saunders (2003) the deductive approach is used to search for causal relationships between variables through deducing a hypothesis, and generalisation of the

theory will not be expected as the inductive approach would be particularly concerned with the context of the research (Saunders et al., 2003). A combined research approaches (inductive and deductive) has been selected. In this research a theoretical framework is first confirmed from the existing literature which will be investigated in the case studies (deductive approach). Although this area is particularly well theorised, there is scope to improve theoretical framework of climatic design (in an inductive manner). The main reason for using both approaches is that the subject is supported by an extensive theoretical background, focusing on the level of peoples' satisfaction and housing preferences and the measurement of thermal comfort inside buildings. This research depends on using methodological triangulation which helps contribute additional knowledge to the research and in that way different methods complement each other. Each of the different methods (questionnaire and semi-structured interviews, as well as direct observation, sampling and the collection of supporting documentation) will help capture a more complete, holistic and contextual portrayal of the cases and reveal the varied dimensions of the best way to conduct passive design in our future housing.

To achieve the objectives of this study, two methodologies have been used to collect data, survey and interview. Air temperature measurements were taken by the first author between the 7th of August and the 7th of September 2008, by using sensors which recorded day and night temperature at 30 mints interval. Measurements were recorded in the living room in four selected case studies; two are located inside the old city and two outside the old city. The first case is a two story courtyard house inside the old city and the residents have covered the courtyard. The second case is a one story courtyard house inside the old city with open courtyard. The third case is a one story courtyard house with covered court yard located in outside the old city and built in 1964. The last case is contemporary two story villa built in 1983. All of the cases are using natural ventilation and fans to cope with the high temperature and humidity. Eight days from starting measuring the temperature, two of the case studies started using air conditioning (case two and three). Accordingly, the measurements concentrate on the first eight days.

5 Discussion

From the observation of the case studies, many courtyards are covered and by exploring the opinion of residents, many reasons have arisen for covering the courtyard as follows:

- The position of the courtyard in the middle of the house is not appropriate; it is difficult in both summer and winter time to move from one space to another.
- It adds extra space with a big area.
- Difficult to use air conditioning.
- Many people wanted to emulate the modern type and saw their own houses as old fashioned
- People associated the courtyard house with poverty, slum areas, lack of facilities, outmoded style and inadequacy of services

By observing some covered courtyard houses, some problems accrued as a result of covering the courtyard as follows:

- A lack in lighting and air movement.
- An increase in the humidity levels.
- An increase in the temperature levels.
- No connection to the outdoors
- Loss of the aesthetic and climatic features (trees and fountain).

The results of the measurements recorded in the four selected case studies (Table 2) are confirmed the theories and the professionals' opinion where the maximum air temperature was recorded in case four which built in contemporary housing and the lowest air temperature was recorded in case two which is the open courtyard house. These results suggest that the courtyard house is the ideal solution in hot climate regions, however, more comprehensive research is needed.

Table 2 shows the thermal comfort inside the cases during 8 days -

	14/8/08	15/8/08	16/8/08	17/8/08	18/8/08	19/8/08	20/8/08	21/8/08
Ext.	31.2	31.2	28.8	30.5	29.5	30.5	29.3	29.7
Case1	29.5	29.5	29.5	29.5	29.5	29.5	29.0	29.0
Case2	29.0	29.5	28.5	29.0	29.5	29.0	29.0	28.5
Case3	30.0	30.0	30.0	30.0	30.0	30.0	29.5	29.5
Case4	31.0	30.0	30.5	31.0	31.0	30	29.5	30.0

According to the theories and the opinions of the professions and some of the householders who are still living in the courtyard houses in Tripoli as well as the temperature measurements in the selected case studies, all confirmed the importance of the courtyard house as the ideal climatic solution in hot regions. However, these courtyards will not work properly unless most or all factors shown in figure (12) are including in their design, particularly:

1- The position of the courtyard in the centre of the house should be changed to avoid crossing them all the time, and using new technology to provide the possibility to cover the courtyard and open it when necessary. (CDAUP, 2008, Muhaisen and Gadi (2005) maintained that special arrangements are required at the design stage to achieve a suitable and satisfying courtyard building. This includes the internal envelope's finishing and materials, as well as the proportions of the physical parameters of the courtyard form. Similarly, El-Dars and Said (1972) explained that the court house in Libyan contemporary housing must undertake a certain further development to accommodate social change and the progressive modern requirements of the Libyan family, together with new advances in building technology.

2-The walls surrounding the courtyard should have a good thermal resistance and a long time lag. Swan, (1991) clarified that, if the walls surrounding the courtyard are thick and of adobe, they store the night's coolness, and gain heat slowly during the day, releasing their stored heat many hours later, when it is needed.

3-The courtyard should include trees and a fountain to provide shade area and evaporation. As stated previously, Fathy (1969) confirmed that the courtyards with their trees, flowers, shrubs and a pool of water can create a reasonable micro-environment, because the tall trees in the courtyards shaded the walls and the ground from the intense direct solar radiation of summer. Both features could reduce the heat gains of the building.

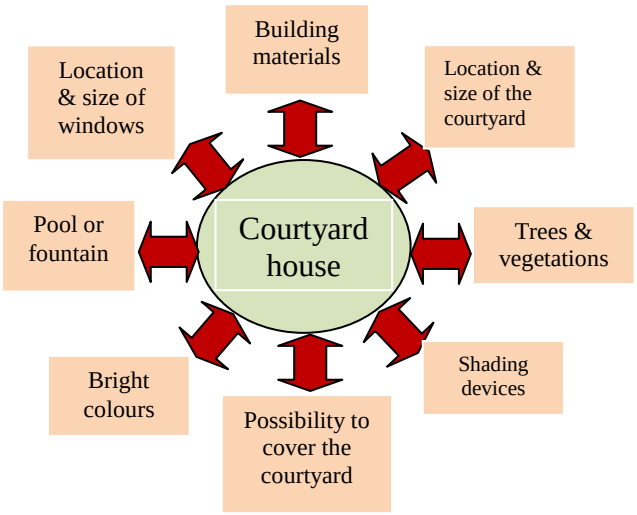


Figure (12) Factors affecting the performance of the courtyard

6 Conclusion and Further Research

The traditional courtyard house is an advanced structure that offers successful social and climatic solutions. Climatically, the open-air interior courtyard performs an important function as a modifier of climate in hot arid areas. While, during the daytime, it allows for outdoor activities to be carried out protected from wind and sun, at night it serves as an air well that provides cool breezes. The thick and nearly solid external walls surrounding the spaces around the courtyard also have a dual function, to withstand severe elements like hot sandy winds on the one hand, and to minimise the penetration of the direct sun rays to the living spaces on the other. Therefore, it can be assumed that the courtyard is mainly a result of physical and behavioral factors. Through an analysis of Tripoli's traditional dwelling one can clearly observe that the design and use of the courtyard does reflect a compound interaction between diverse environmental and cultural aspects.

From a climatic point of view, the courtyard offers necessary shade to the adjacent rooms in summer since it is usually surrounded by arcades, while in winter it offers a warm place. The courtyard protects the families from the harsh climate, as well as offering daylight and natural ventilation to the surrounding spaces. The results obtained from the thermal investigation and the interviews with professionals and householders explore the potential of a courtyard for passive cooling in a warm humid climate. Accordingly, the courtyard house remains an appropriate built form and it could still fulfill the requirements of contemporary lifestyle if redefined and considered in the light of technological and socio-economic changes. This paper confirms that the courtyard house is the ideal solution in hot regions if some changes are incorporated created at the design stage to achieve the satisfaction of today occupiers. It explains the reasons raised

for covering the courtyard and the problem accrued as a result of covering the courtyard and suggests some ideas for re using the courtyard in new architecture. The implication of these conclusions on architectural design gives useful guidelines in designing naturally ventilated high mass residential buildings with internal courtyards in warm humid climates.

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Combining Methodologies for Appropriate Determination of Programme Justification and Success Criteria in Housing Renewal

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Abstract:
Housing Market Renewal (HMR) has proved a controversial policy, as demonstrated by substantial numbers of residents fiercely resisting demolition plans. Formulating housing policies acceptable to communities will challenge future policymakers. The research community must build on the work of contemporary scholars to develop more sophisticated ways of providing an evidence base about locales, to improve policymaking. This paper steps back from the present position by evaluating appropriate project justification and success criteria in a predominantly South Asian homeowners' area. Contemporary regionalist approaches and quantitative analytic methods rightly assess housing market activity as a basis for intervention. However, blind spots embedded in such approaches inadvertently obscure community diversity, heightening programme failure risks. Combining methodologies generates more accurate and inclusive knowledge, thereby securing regeneration prescriptions more acceptable to communities. Furthermore, the paper contests that current research tools are too methodologically and theoretically 'blunt' to capture the complex functioning of communities. In conclusion, addressing this matter requires dedicated funding streams to permit the future development of more sophisticated forms of qualitative analytical methods to complement contemporary quantitative methods.

Keywords:
Ethnicity, housing studies, methodology, project evaluation, regeneration.

1 Introduction

The period spanning 2002-2007 was a distinctive period of urban policy history, whose hallmark, unlike previous private sector housing policy orientation in the period spanning 1979-2002, was radically 'interventionist' in its impact on the everyday lives and housing pathways of low-income homeowners living in ailing post-industrial cities and towns. The Housing Market programme launched in 2003 was created specifically to tackle the problem of low-demand housing at sub-regional level targeted at the most deprived areas in the North of England and in the Midlands. The HMR programme is part of a wider national regeneration programme to halt and reverse the economic and

social deprivation in our cities. Its intention is to demolish obsolete housing in low demand areas replacing it with new built housing to change the pattern of employment and migration that was reported to have undermined the demand for housing. A characteristic of this policy was therefore a swing back to a national housing clearance programme, after a hiatus of thirty years, with proposals to clear a surplus of pre-1919 terraced housing with the intention to demolish 90,000 properties over a period spanning from 2003 to 2018. In practice, this did not materialize and this figure has now been reduced to 57,100 (Audit Commission, 2007). In summary, to date the programme has refurbished 40,000 houses, acquired and demolished another 10,000 houses and built 1,000 homes. (Audit Commission, 2007).

One of the reasons cited for its modest achievements in terms of new build is the organized campaign by stakeholders determined to stop the clearance of housing in targeted areas that has impacted on delivery (Audit Commission, pg. 26, 2007). Arguably the unpopularity of the programme has sparked a renewed interest in good practice in community engagement evidenced by the launch in 2007 of 'Good Practice Guide Community Engagement in Housing Market Renewal' and the National Audit office issuing of new key principles that should underpin community engagement in HMR neighbourhoods. A key recommendation made by the House of Commons Committee of Public Accounts, making explicit the government's continuing political commitment to engaging with communities, was that "Neighbourhood Regeneration is more likely to be sustained if local communities are actively engaged in the decision-making" (June 2008).

Further evidence for the significance and materiality of this research problem is that the general unpopularity of housing clearance programmes on targeted communities is an emerging theme in the literature review of (for example), Jenning, 1962. In particular, they have proved unpopular with South Asian communities. For example, the researches of Stoker *et al.*, 1985, note fierce opposition from South Asians and willingness to fight at grass roots level to save their homes from housing clearance programmes. The critical work of Karn *et al.* (1995) highlights the fact that segregated housing areas are highly problematic for the formation of renewal strategies which are both acceptable to communities as a housing solution and retain economic efficiency. The key point is that the impact of such policies on the ethnic diversity of the clearance area and the wider community is substantially unexplored. The overarching rationale for carrying out this research is the need for an evaluation of the programme in its natural setting the 'local' by examining and understanding the culture of communities that have proven to heighten the risk and to aid the development of housing regeneration programme that will be more acceptable to communities and thereby contribute to sustainable development.

The aim of this research is then to step back from where we are in policy terms at present and assess the appropriateness of a programme justification intervention and success predominantly criteria based on quantitative data, the analysis of housing markets and demographic, social and economic indicators, and thereby shed light on the barriers to HMR implementation by studying and understanding the culture of community. The research was carried out using the ethnographic method. The term ethnography refers to "social scientific writing about folks" (Silverman, pg. 45, 2001).

The utility of the ethnographic method is that it secures knowledge to improve the evaluative information so that a judgement can be made about the appropriateness of the regeneration programme and thereby determine whether the programme is congruent with the culture of the neighbourhood. The ethnographic fieldwork is therefore central to the evaluation process.

As Brewer writes, “ethnography is the study of people in naturally occurring setting or ‘fields’ by means of methods which capture their social meanings and ordinary activities, involving the researcher participating directly in the setting, if not also the activities, in order to collect data in a systematic manner...” (Brewer, pg.10, 2000).

The empirical focus of the research presented is limited to one in-depth longitudinal case study (spanning a period 2003 to 2007) of one community targeted by a housing demolition project. It is an area of former mill workers’ houses, now mainly occupied by Pakistani households. The council’s programme justification was to demolish the housing stock as part of a comprehensive regeneration strategy to reverse social and economic problems in town and put in place “sustainable communities” as the area was low-demand and as such was a threat to the sustainability of the surrounding areas. The programme success criteria was to replace terraced housing in the order lands with modern expensive housing intended to attract and retain more affluent home-owners to the town, thus furthering the aim of a “community in the neighbourhood", in the interests of regenerating the local economy and the good of the wider public interest.

In summary the research findings are as follows; programme justification and success criteria based solely on a realist methodological approach accompanied by the analysis of statistics goes some way towards explaining the social and economic disparities in our cities. This, in turn, secures a robust case for the intervention of housing regeneration projects to address the phenomena of low-demand and restructure the housing market. Its strength is that it identifies the ‘real’ social and economic structures undermining sustainable development, irrespective of the cultural housing preferences of our communities. A process of disengagement is evident at micro level, because the programme justification research has not managed to take into account the wider social and economic reasons accounting for the historical emergence of areas and the reasons why a significant number of South Asians live in such areas today in 2008, namely the structures of inequality.

Furthermore, solely relying on one methodological approach such as ‘realism’, with a heavy emphasis on statistical analysis, screens out swathes of social reality at neighbourhood level. It closes down a dialogue between other methodological approaches, such as the one applied in this paper ‘hermeneutics’. The application of hermeneutics would have revealed that the relationships to home, self and community are complex and sensitive and thereby policy makers and planners need localized intelligence bases to assess the acceptability and the impact of regeneration projects on communities prior to the engagement process. Taking this into account may have secured a more robust evidence base for programme justification based on a more inclusive egalitarian social reality by considering the stance of residents living in the neighbourhood whose cultural practice and the meaning of the neighbourhood sit outside of the epistemological vantage point of the policy makers and implementers.

The over reliance on a realist methodology accompanied by predominantly quantitative methods is identified as being one process in the *complex cycle of disengagement in the regeneration activity* identified in this research project. Furthermore, the processes of the cycle of disengagement are complex. The institutional power processes and the residents' dynamics intersect, giving rise to a conspiracy theory in the neighbourhood about the Local Authority's intentions. This engenders a deep mistrust and closing down of possible regeneration solutions. In summary, the power dynamics between the residents and the institutional power structures in the regeneration activity are more complex than previously acknowledged in the HMR research literature and requires more sophisticated methodologies and tools to capture the distinct realities in our communities.

The contribution made to knowledge is, firstly, to add to what is already known about the unpopularity of housing clearance projects in areas predominately occupied by South Asian communities. The originality of the work is centrally the ethnographic fieldwork, which secures empirical evidence, which is unprecedented in depth in the HMR research and thereby secures in-depth improved evaluative information. The rationale for using the ethnographic study limits scope because the aim was to secure rich understanding of the problem, which was not inaccessible, but would remain undetectable through standard interviews and questionnaires. The scope of this paper is thereby limited to one empirical setting and therefore its conclusions are not generalizable in the Comptean sense to other communities. However, despite these limitations, the method is unsurpassable in that it secures more in-depth data and theoretical insights than can be used first to carry a detailed theoretically informed evaluation in other regeneration sites. The added value of such ethnography for the research community is succinctly highlighted by Fielding (2001) "as a means of gaining a first sight into a culture or social process as a source of hypotheses for detailed investigation using other methods, it is unparalleled".

2 Background to the Paper

The work of Anwar, 1979, is informative about the reasons for South Asians emigrating to Britain in the 1950s and 1960s and why today significant numbers live in inner-city low-demand areas. Anwar's 1979 research cites the reason for emigration to Britain can largely be explained in terms of the lack of employment in Pakistan and the availability of work in Britain. In addition, the events around the demise of the British Raj Empire in 1947 that led to the partition of India devolving into India and Pakistan, and the events of 1971, when West Pakistan and Pakistan were partitioned into Pakistan and Bangladesh, were prime reasons. There is a degree of consensus amongst scholars about the reasons for emigration. This is explained in terms of a combination of 'push' and 'pull' factors, namely the lack of economic incentives and political unrest in the homeland and pull factors that drew the migrants to Britain, including good employment prospects due to of South Asians took up residence in pre-1919 terrace houses. Today, in 2008, there still remain clusters of South Asian living in ailing post-industrial mill towns in low-demand housing areas - areas targeted for HMR demolition. For example, in the East Lancashire Pathfinder area 15 percent of the population are of Pakistani origin, as quoted in the National Evaluation of HMR Pathfinder Programme 2007 Baseline Report.

The review of literature is informative. It reveals and alerts the researcher to the more localized dynamics of such communities, giving clues to the possible reasons for the barriers to programme intervention and sensitizing the researchers to the localized dynamics that remain silent in the low-demand policy discourse. Among poor homeowners, there are a disproportionate number of ethnic minority groups, especially South Asian homeowners, who live in dereliction and deprivation (Ratcliffe, 2002). Making reference to South Asian home owners, Ratcliffe draws attention to the fact that "…. most commentators point out that many dwellings are at the bottom of the housing market and are in a serious state of disrepair" (Ratcliffe, pg. 131, 1997). Data from both the 1991 census and from many housing need surveys have shown that overcrowding is a very serious problem, particularly for the Pakistani community (Ratcliffe, 1997). Further research highlights the human misery and personal sacrifice caused by poor housing (Ahmed & Begum, 1998) while Karolia's 1996 work demonstrates how owners become trapped in unfit housing. Evident from the literature review is that there are complex reasons why these communities have developed. This includes the revelation that certain sets of needs which receive less priority in modern white culture, in the context of Asian culture actually transcend even such basic needs as the human right to a damp free dwelling. Housing needs stretch beyond dwelling quality to other more pressing needs, to the fear of isolation from one's community support networks and cultural amenities for example (Bowes *et al.*, 1999).

Traditionally, academics have used the choice and constraint theories to provide a conceptual framework to understand ethnic segregation. Theorists of choice maintain that ethnic communities have voluntarily chosen to reside together for common linguistic, cultural and religious tradition (Dhaka, 1974, Khan, 1977, Anwar, 1979). At the other extreme, constraint theorists advocate that the segregation is involuntary, caused by exclusion from types of housing but primarily due to discrimination in the allocation of properties or the channelling to certain areas (Daniel, 1968). The generally agreed consensus adopts a middle position in that ethnic groups have a degree of choice within a system of constraint (Sarre *et al.*, 1989). Using the same conceptual framework of choice and constraint theory to understand why in certain parts of the country ethnic minorities have chosen owner occupation tenure, choice theorists cite cultural preferences of ethnic groups, interwoven values and a desire to return home (Danya, 1974), while Karn *et al.*, 1985, revealed that the primary reason that South Asians bought homes was financial. Secondary reasons were security and independence. In direct contrast, some theorists have argued that discriminatory allocation in housing and being unable to apply for housing has influenced tenure preference. What is clear from the literature is that a combination of structural factors have perpetuated poor housing conditions, including economic disadvantage, social exclusion, instructional racism (Balchin, 2002) and the distinctive dynamics of South Asian homes.

3 Research Methodology – "Combining Methodologies"

The aim of the following section is to illustrate the utility of building a combined methodological approach into the evaluation process. My approach to methodology heavily draws on the work of Saukko (2003) 'Combining Methodologies in Cultural Studies' and Haraway (1988) notion of 'Strong Objectivity'. In this paper, the usage of

the term ‘methodology’ is derived from the social science field of cultural studies referring to ‘the wider package of both tools and a philosophical and political commitment that come with a particular research ‘approach’. In contra distinction method refers to the practical ‘tools’ to make sense of empirical reality (See Saukko, pg. 8, 2003).

Combined methodology secures a more inclusive egalitarian epistemic vantage point to assess the appropriateness of the programme justification. This is achieved by combining a hermeneutic approach for the study of residents lived experience and a contextualist critical analysis of the official positivistic discourse that legitimises the housing clearance project. Each approach has its own retrospective validity. A dialogic lens is used to test the validity of the hermeneutic approach to measure the extent to which the research has captured the residents’ situated activity and lived experience. The second approach applies a contextualist or realist lens and judges the extent to which the regeneration evidence base understands the social, economic and political context that offer an account of the historical emergence of such segregated areas including the contemporary connection to the immediate environment.

The combining of methodologies with different notions of validity clearly challenges the singular notion of truth arguably prevalent in evidence based practice in housing regeneration and the positivist quest for objective value free science ‘objectivism’, a position premised on the notion that researchers can have apolitical unmediated access to an external reality. The authors are equally skeptical about defeatist post- modern embrace of relativism, which completely gives up the quest to generate reliable scientific knowledge, refuting the real.

Studying the interplay between lived experiences and the contextualising discourses and texts previously described in the paper then clearly entails a re-think and a shift from an ontological position that views social reality as a fixed object knowable and stable and external to the researcher and the accompanied quest to mirror social reality. And secondly a shift in ontological position that denies there is a ‘real’ a resistance beyond the research and advocates a social constructionist epistemological position.

In contrast to these approaches a material semiotic perspective informs the researchers’ ontological and epistemological stance. In terms of ontology the relationship between reality and research is ‘interactive’ in nature. In taking up this position the researchers’ epistemological position is material semiotic construction of reality. A position that advocates that research knowledge both creates social reality and also constrained by social reality. There is an acknowledgement that

“Research is always facilitated and constrained by the existing social and material environment and it needs to understand, for example, structures of social equality or the basics of ecological reality, if it is going to change them’ (Saukko, pg.29, 2003).

In taking up this material – semiotic perspective the rationale underpinning the research methodological design ‘combining methodologies, each with their own respective validities helps to steer the research towards more egalitarian and inclusive and therefore a *strong objective* and more accurate inclusive social reality as opposed to weak objectivity. *Strong objectivity* has been achieved when the research has captured

and taken into account a range of standpoints including those of subjugated groups to create a more inclusive and accurate reality. Equally important, the researcher arrives at self-reflexivity and recognizes the social situatedness of the knowledge produced; in effect recognising that the cultural assumptions we bring to the research process is un-transcendable. Adopting a multiple methodological approach also facilitates a dialogue between different methodological approaches and in doing so builds self-reflectivity into the evaluation process, a situation in which the social scientist is aware of the social situatedness of her/his knowledge. *Weak objectivity* is when research lacks reflexivity, purporting to be objective, value free and impartial, thus rendering invisible to itself its own service to power, occluding difference and foreclosing critique. (Haraway, 1988).

'Hermeneutics' (Shorter Oxford English Dictionary) is the art or science of interpretation. Simply put, it means the process of interpretation. This is a particular useful approach to secure evaluative information because it is committed to interpreting the culture in the neighbourhood and thereby builds self-reflectivity into the research design because the aim is to be truthful to the lived experience of residents and understand the culture of the neighbourhood. This approach requires the choosing of an accompanying practical method tool to capture life in the neighbourhood in order to generate the empirical data to make a judgement about the appropriateness of programme justification and success criteria. The chosen method to accompany the ethnographic method is a descendant of the classical tradition of anthropology. The value of the method is that it secures a window into the culture of the subjects to investigate and interpret the significance of home, identity and the neighbourhood, and how policy practice intertwines with the cultural practices of the community, hence generating empirical data for the assessment exercise. The value of the method is in 'discovery' (Fielding *et al.*, 2001).

As Brewer writes, ethnography is the study of people in naturally occurring setting or 'fields' by means of methods which capture their social meanings and ordinary activities, involving the researcher participating directly in the setting, if not also the activities, in order to collect data in a systematic manner…." (Brewer, pg.10, 2000).

The data analysis of ethnographic work is demanding because of the large amount of data (Fielding *et al.*, 2001). Like many other ethnographers, the researcher used a procedure called sequential analysis, a method of analysis suggested by Becker, 1971. In this method, the analysis of the research data is done sequentially and begins in the field. The idea is to constantly check interpretation against the data and to reflectively gain new insights that direct the data gathering process. This is done until the researcher is satisfied that they understand the culture of the community in relation to the key concepts of home identity and community that were derived from the initial data gathering exercise. Interview material and field notes were analyzed by using thematic analysis to identify themes in the data. Finally, in order to check the researcher's understanding, the residents were further interviewed and tape-recorded.

4 Findings and Discussion

A key concept relevant to the assessment of the appropriateness of programme justification and success criteria to test the rationale for intervention is the notion of

'failure'. This is defined by the Government '3 Rs Guidance' as being 'the justification of a policy intervention in terms of the market failures it aims to correct'. The assessment reveals that a realist methodological approach accompanied by statistical analysis secures a robust case for HMR intervention to alleviate the economic and social deprivation in the public interest. The research justification highlights the need for social and housing regeneration to halt and reverse by restructuring the housing market. This point can be evidenced by the Department of Transport Indices for Social Deprivation as well as the growing research identifying the phenomena of low demand. The area was one of the most deprived in the country. The strength of the justification research is that it captures a breakdown in the capitalist system and it identifies the structures that pose a threat to sustainable development. These include the negative impact of economic restructuring relating to the decline of the manufacturing and mining industries, the related social migration out of these neighbourhoods and the changing housing aspirations of our communities that undermine sustainable development (Leather, 2002). A distinguishing feature of the HMR programme is its scientific knowledge based approach to regeneration in the sense that it responds to changing processes in the housing market manifested through three analytically distinct strands. These are as follows: Stock obsolesence, surplus housing stock and unpopular neighbourhoods. It therefore suggests a grand narrative about the social world.

The programme justification and success criteria in this case study are revealed to be inappropriate because they are identified as being one process in the complex cycle of disengagement which triggers the resistance. This is especially the case in relation to truth claims made about the changing tastes and aspirations of communities and the fact that this neighbourhood was given the label 'low-demand housing area'. These are misconceptions which arose largely because no attempt was made by the Local Authority to increase the external validity of the type of generalizations made by carrying out investigation into the more localized dynamic of this neighbourhood. It may have been useful to complement the realist methodological approach with a hermeneutic methodological approach that explores the meaning of home, community and neighbourhood, thus endeavouring to secure a more inclusive and egalitarian social reality, i.e., what Harding describes as strong objectivity.

To demonstrate this point by example, the residents in this case study protested that the methodology underpinning the research characterized their area as a 'low-demand area' as part of the process of identifying it for clearance. Their opposition was based in part on the conviction that the forces identified as producing low-demand regionally had no bearing on the realities of their unique area. (The Government based its Pathfinder Policy on research conducted by Birmingham University and others into the phenomenon of low demand).

By way of example, residents complained that the methodology failed to consider that void properties in Asian areas could be explained away by the South Asian cultural practice of buying properties, with the intention of retaining them for another member of the family or future generations. The testimony of South Asian residents challenges the epistemology of how the government and other agencies constructed and constituted a housing problem.

The adoption of the hermeneutic methodological approach reveal the blind spots inherent in using this approach that wiping out swathes of social reality. The first complex theme identified is that the relationship to home, self and other is very complex and is in fact a cultural practice involving the reproduction of the identity of community members. The data shows that the identities of the residents living in the area are complex and diverse. However, one identity central to the resistance is the identity of communal member. In the narratives, residents living in this community described their lived reality of the urban space. This secures an example of the way in which community and family membership are enmeshed in a joint housing/cultural practice. To be more explicit, housing practice is about 'a family can do discourse', a discourse silenced in the theory of low demand, standing in direct contrast to the Neo-Liberal Housing policy discourse 'housing as assets'. In making their counter-narratives, residents drew on more localized family and cultural discourses, security, friendship, happiness, shared understanding, common interests, family and community support mechanisms and pulling together in times of crisis.

A sub-theme of difference emerges from the data. Housing needs for this community stretch beyond dwelling quality to other more pressing needs, such as the fear of isolation from one's community support. In short, this minority community has different housing needs from what is considered the case for the indigenous population. Community life is about family and neighbourly values. Examples of this in the case study data include the practice of community support systems, i.e., looking after children by the extended family while parents are at work, looking after sick members of the family and pooling resources together to look after the housing needs of members of the community.

Analysis of the data reveals that the collision of community and regeneration dynamics instigates a process of disengagement, which leads to a breakdown in the relationship between the community and the Local Authority. In this case study, for many community members the regeneration project was perceived to be a threat to the sustainability of the community because it entailed the destruction of the infrastructure on which their communal identity is reproduced. In contradiction of the housing low-demand discourse, housing holds high social capital in terms of providing low cost affordable flexible accommodation, because it is affordable to all members of the community including its poorest members, who can rent properties from the richer members of the community.

The data indicates that regeneration success criteria instigated a conflict in the community. This is evidenced by the ethnographic transcripts of community activists, some of whom had previously supported a smaller demolition programme. The process of disengagement gives rise to fuelling suspicion that there was a conspiracy in the neighbourhood about the Local Authority's intentions, fostering a deep mistrust in the community, and closing down regeneration solutions. This subsequently further undermines sustainability of the neighbourhood by undermining the social cohesion, triggering a conflict between the modern and more traditional members over the right to exercise their self-styled housing practice.

5 Conclusion and Further Research

In summary, the paper puts forward the argument that the dynamics are complex. Programme justification and success criteria derived from a realist methodological approach accompanied by statistical analysis does capture the general societal processes accounting for the re-structuring of the housing market. However, it becomes de-sensitized to the complex working of communities.

Furthermore, the argument put forward is that there is a need for evidence-based approaches to regeneration, to adopt a multiple methodological approach to firstly create a more inclusive 'accurate' social reality and to secondly promote dialogue that builds self-reflectivity into the research design. The evaluation revealed that the programme justification and success criteria were inappropriate because they were not congruent to the dynamics operating in this community and fuelled one process in the complex cycle of disengagement which heightened programme failure.

There is an urgent need for researchers working in the field of regeneration to sharpen their theoretical tools. This is a pressing issue in a policy context in which increasing importance is placed by the government on the quality of the stakeholder process in HMR neighbourhoods. This is evidenced by the Audit Commission's announcement in 2007 of the key principles that should underpin community engagement. Key Principle 1 requires the assurance that proposals and plans for intervention are based on a detailed assessment; the 'vibrancy 'of the community, for example, by a systematic measurement of its social capital. The emphasis is placed on the social, cultural and contextual considerations in the analysis for the development of the proposals for the area. This is a challenging request, and will require the development and application of sophisticated methodologies and research methods by research teams that have undergone the appropriate research training to develop ways of theorising and measuring it.

To quote another example, Key Principle 2 requires that the community itself fully understands what the proposals are and why they have been drawn up, by ensuring that a resident's representative is chosen from each street in the zone, with a clear remit to change proposals if necessary: 'Urban Regeneration Proposals' (Audit Commission, 2007). While this principle is to be commended, housing clearance projects as evidenced by the literature review and the findings in this research are controversial. There is a need for understanding the cultural dynamics of the neighbourhood, because failure to do so can contribute to programme failure. Arguably, prior to the formal engagement process, there is a need for skilled ethnographers and other suitably qualified social scientists to undertake research to understand the cultures of our communities because, as Maginn (who incidentally recommends the potential of collaborative planning and applied ethnography to realise more effective community participation) points out, "conflict and mistrust are, of course, inevitable facts of life within all kinds of decision making structures" (Maginn, pg. 26, 2007). This further supports the case for suitably qualified researchers to enter the field in advance of the formal engagement process.

The paper concludes that dedicated funding streams are desperately needed to permit the development of more sophisticated forms of qualitative analysis methods to

complement contemporary quantitative methods to further the achievement of sustainable development.

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Towards sustainable urban development: strategies in creating a pedestrian friendly city

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Abstract:
Sustainable urban development aims to meet the needs of its inhabitants while preserving the local environment. Good quality design can encourage living and working patterns that mean less car use, reduce consumption of natural resources and increased biodiversity (CABE, 2005). Therefore, the design and operation of sustainable city should be efficient enough to allow it's inhabitant to move around safely and effectively within its networks. Pedestrian movement is considering as one of the most important modes of transport in a sustainable city to links the activities and attractions in public spaces through streets, sidewalks and lanes. By walking, people are able to interact with the surroundings more intimately as well as with other pedestrians while moving towards their desired destination. This paper reviews the literature in order to identify the strategies behind creating and promoting pedestrian friendly city through walking. It will identify the physical quality of public space and walking networks that facilitate pedestrian movement in the inner cities. The work is being undertaken as part of PhD studies at SOBE, University of Salford funded by the Malaysian Government.

Keywords:
Pedestrian movement; pedestrian friendly environment; quality public spaces; sustainable urban development; and strategies and design approaches.

1 Introduction

A great challenge to all major cities in Europe and worldwide, is how to overcoming problems in traffic congestion, fatal accidents, poor air quality, degradation in the urban environment and quality of life. Urban traffic is responsible for 40 percent of CO2 emissions and 70 percent of emissions of other pollutants arising from road transport (Portal, 2007 and European Commission 2007). It is estimated; around 80 percent of European citizens live in an urban environment. As towns and cities are the generator of the European economy, they invite investment and provide job opportunities to the citizen. Urban areas constitute the vast majority of the population that occupy the urban living environment (80 percent of EU citizens are urban dwellers).

Town and road planning interventions and the mobility needs of citizens have added to high increment of automobile use during the last few decades. The number of passenger kilometres by private car per capita increased by 90 percent in Western Europe between 1970 and 1990. In 1990, the average number of passenger kilometres travelled by private car in the Western–European about 8710 km (OECD, 1996). The number of motorised vehicles in the world grew by about 600 million between 1950 and 1990. Of the 675 million motorised vehicles in 1990, approximately 80 percent were for passenger transport. However, the number of people in the world not owning a car increased even more in this period, by over 2 billion (Adams, 1999; OECD, 1996) who solely travel using public transportation and non-motorized transport such as walking and cycling.

Due to this phenomenon, government agencies of all level show an increased interest toward promoting non-motorized travel options towards limiting the excessive automobile use in the urban environment (Jean-Christophe Foltete *et al*, 2007 and Sisiopiku, V. P. *et al*, 2003). Many agree that for several recent years planners and traffic engineers have been paying more attention to the expectations of pedestrians who are more aware of the urban environment and developing safer environment for the pedestrian (Sisiopiku, V. P. *et al*, 2003 and Mangin and Panerai, 1999).

The trend of ‘‘new urbanism,’’ for example, encourages developing pedestrian friendly environment, which would offer proximity of pedestrians to shared the urban amenities. However, the initiatives that promote pedestrian travel must provide potential users with an assured level of convenience, efficiency, comfort, and security in their physical built environment (Sisiopiku, V. P. and Akin, D., 2003.). It is very crucial to invest for good quality design in our urban environment as to enhance the quality of life for the citizen. Good urban design is emphasised in the British Government’s plans for urban renaissance to improve the design, management, and environmental quality (see CABE Space, 2004; ODPM, 2003a). In London for example, the mayor and Transport for London (TfL) are committed in making London as one of the most pedestrian friendly cities in the world. Further to the aim, the first campaign Walk to Work Day in London was held in April 2007 launched by TfL (BBC News, 23/4/07). Hence, the improvement on the existing physical and social infrastructure is needed as to foster pedestrian culture in community. According to Goodman,D., 2008, communities cannot become pedestrian friendly in overnight time. It required action from all parties to be involved in making the city more attractive and sustainable for the next generation.

In this respect, the paper describes the criteria needed in the urban spaces to permit more pedestrian friendly environments. The focus would be on the relationship between public spaces and pedestrian movement in the city centre that encourage social inclusion and community cohesion discussed in section 2. In section 3, the method use in gathering data pertaining to pedestrian friendly environment is reveal. The available evaluation techniques to assess the existing pedestrian environment for the improvements, paper conclusion and further research programme are offered in Section 4 and 5.

2 Public spaces and Pedestrian movement

2.1 Definition of Public Spaces

City's around the world are different in thins component. What makes each city environment differ to one another is the attractiveness and effectiveness of the public spaces. Many scholar defining public spaces as a place people have access without permission, expressed or implied, and in which they can decide individually about how to conduct themselves. Most American researchers include malls, retail shops and sidewalks as public spaces (R. Ehrenfeucht and A. Loukaitou-Sideris, 2005). In the UK, CABE Space (2004) define " public spaces is all around us, a vital part of everyday urban life: the street we pass through on the way to work, the places where children play, or where we encounter nature and wildlife; the local parks in which we enjoy sports, walk the dog or sit at lunch time, somewhere quiet to get away for a moment from the bustle of a busy life. In other words, a public space is our open-air living room, or outdoor leisure centre."

Public spaces are seen as a vibrant component of a city that could shape the city image that creates identity and uniqueness and influences other people's perceptions. It is also as a fundamental feature in the city that represents sites of sociability and face to face interaction (V. Cattell et.al, 2008).

Development agencies in the UK such as North West Regional D.A, through its Places Matter programme (Renew Northwest, 2007) advocate the importance to understand the public spaces as a three dimensional covering the floor plane spaces, integral elements and built edges that enclose and define the spaces. They further argue public spaces should not be seen in isolation but in the context of its adjacent buildings, their uses and its location in a wider network of public and private spaces. They define public spaces comprises the streets, squares, parks, green spaces and other outdoor places that require no key to access them and are available, without charge for everyone to use.
Another non-profit organization called Project for Public Spaces based in New York listed ten benefits of creating good public spaces that have been successfully tested through several projects. The benefits no doubt are supporting the local economies; attracting business investments; attracting tourism; providing cultural opportunities; encourage volunteerism through community participation; reducing crime; improving pedestrian safety; increasing use of public transportation; improving public health and improving the environment (Walk 21 Conference, 2008).

Both organizations agreed that good quality public spaces are vital for creating harmonious, socially inclusion for sustainable communities. It is very clear intention that the creation of quality public spaces could meet the sustainability definition by Brundtland Commission which defines sustainability as development that:
. . . meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987, p. 24). Much clearer picture on sustainable development is shown in the PICABUE principles that highlight concern about the quality of the environment, the equity of resource consumption, as well as the participation of the public in decisions that affect their lives, particularly in understanding the future implications of

decisions taken today, on the environmental systems and on current and future generations (Deakin,M., and Curwell, S.,2004).

In research carried out for Commission for Architecture and the Built Environment (CABE), 85 per cent of people surveyed felt that the quality of public space and the built environment has a direct impact on their lives and on the way they feel (CABE, 2003). However, those public spaces in the city centre could only play their role if they are all well connected. J. Barnett (2004) used the idiom from Jan Gehl, Danish architect 'Life Takes Place on Foot' that asserts no matter what technical innovations are taking place, opportunities for face to face contact still need to be built into daily life. People pursue necessary activities that take them through public spaces. If the environment is attractive, people will linger and engage in optional activities, which lead to sociability: people meeting accidentally or striking up a conversation with strangers.

2.2 Pedestrian movement in public spaces

There are four components of public spaces namely movement space; places of transaction; places of assembly; and public and cultural buildings (B. Erickson, 2001). Movement space been highlighted as the first component of public spaces that offer the most basic function of public space which is to allow access to private buildings and three other public space's components. It is usually performed by streets, footpaths, routes, alley, boulevard, boulevard, etc. Jane Jacob (1961) raised her opinion about streets as the first element when thinking of a city. If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull. Scholars agreed such movement spaces certainly need a new approach to make them enjoyable places to be, rather than just a way to get from A to B (Hoehnke, E.,2008 and Pharoah, T., 2008).

The main focus of this paper is to investigate the physical element in the urban design that could promote for pedestrian friendly environment. The question is in what kind of environment that is friendly for those who choose to walk as their mode of transport in order to connect them to their desired destination in the city centre. What are the urban design features that could help people to navigate efficiently through the city?

Many scholars agree that in order to create a lively and convivial public spaces it depends on how attractive the places are (Bentley et al., 1985, Robert,M. 2001 and Erickson, B., 2001). Researchers have included the Kevin Lynch's urban design elements such as paths, landmark, edges, districts and nodes (Kevin Lynch, 1960) are needed in order to guide people movement in the city. For examples, people move through the city from one districts to another using paths. Each district has its own special landmarks and memorable features like squares that give its own identity. Those elements are believed to furnish pedestrian experience while walking.

Robert. M, (2001) suggests that in order to promote convivial experiences; designers need to consider the relationship between activities, buildings and spaces. She also addresses Copenhagen as an example of a city that has achieved a great pedestrian conviviality. The City of Copenhagen produces policies that are hostile to cars and friendly to pedestrians and cyclist, and the traffic has remained stable in the city for the last 30 years. Eighty per cent of all journeys undertaken in the city are now on foot and

the population of the city centre has also risen (Jan Gehl, 1987, 1995). Researchers summarized activities such as people sitting in parks, streets and squares, looking at each other, and looking at the view, eating and drinking in outdoor café are the contributors to a lively street life (J. Barnett, 2004, Bently et al, Jan Gehl, 1995).

Photo: People enjoying the public Art in La Ramblas, Barcelona (2008)

Most pedestrian movement are occupying the sidewalks along the street, therefore an active frontage is also seen as another factor that could encourage pedestrian friendly environment. An active frontage allows visual relationship between the person outside and the activity inside (Erickson,B., 2001 and Robert,M, 2001). Apart from interactive retail or building frontage, at a scale to which human beings can relate also determine the pedestrian comfort. Pedestrian could feel distracted and claustrophobic if the scale of development to the pavements and walkways' are not appropriate in size (Robert, M., 2001 and Bently et al, 1995).

The Urban Design Compendium 1(UDC 1) (2000) also highlights the important of connection as one of the key aspect for the city's interaction. The success of the city centre depends on how well the connection works. Each quarter of the city needs to be

linked up as to assure greater integration. People should be given maximum choices in how to conduct their journey, with a presumption in favour of walking, cycling and public transport. Apart from providing a maximum number of choices in how people move around easily in their environment, the route design must be feel safe as well. The needs of people on foot could be further analysed using the Five C's principles are as below (UDC1, 2000):
Connections – Do good pedestrian routes connect the places where people want to go?
Convenience – Are routes direct, and are crossings easy to use? Do pedestrians have to wait more than 10 seconds to cross roads?
Convivial – Are routes attractive, well lit and safe, and is there variety along the street?
Comfortable - What is the quality and width of the footway, and what obstructions are there?
Conspicuous – How easy is it to find and follow a route? Are there surfaces treatments and signs to guide pedestrians?

The Five C principles extensively used for evaluating the quality of environment that is ideal for the pedestrian in the city. For example London Analytics working with analysts at Space Syntax Limited have carried a specific research on the pedestrian movement and the environment based on the Five C principles. In 2001, The Walkability Index has formulated which later developed into the International Walkability Benchmark. The objective is to replicate measures of the public realm across an entire area (http://www.londonanalytics.info/walkability).

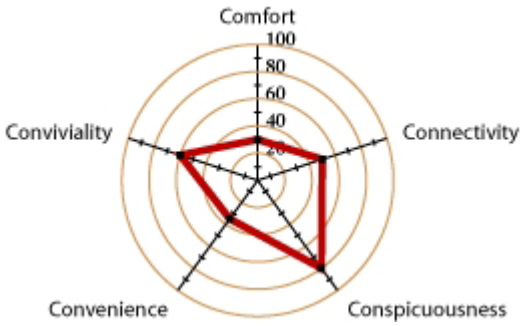

Diagram for International Walkability Benchmark (http://www.londonanalytics.info/walkability)

3 Research Methodology

The study began with a review of relevant materials from textbooks, journals, conference papers, refereed publications, research reports, and internet information to understand the state of pedestrian friendly environment with the issues of urban and community sustainability. Existing studies on public spaces and pedestrian movement in the city centre were then reviewed and their relationships were identified. By integrating the previous studies, authors had discussed the urban design elements and the importance of assessing the existing environment which would contribute to the creation of pedestrian friendly city.

The purpose of the literature review was to find research gap and to develop a research framework. The review is intended to support the development of pilot surveys and interviews of pedestrians and experts in case studies in the later stages of the research project.

4 Findings and Discussion

The review of relevant literature has identified the quality of the pedestrian environment could be evaluated and measured according to the degree to which it meets pedestrians' needs. There are various evaluation methods that are available to UK practitioners, which can be broadly divided between Level of Service (LOS) assessment techniques, pedestrian reviews (or checklists) and community-based audits (Cerrano, M. et al.,2008).

LOS Assessments

Techniques have been developed in the USA (and elsewhere) to measure LOS provided for pedestrians, based on the amount of available space per pedestrian taking

into account pedestrian flow and density conditions (e.g. Fruin, 1971). LOS is defined on a range of between five and six different service levels using letter A-F based on the assessment of the factors affecting LOS (e.g. LOS A, where average space is 12sqm which is ideal for pedestrian condition to LOS F where average space is less than 0.6sqm which is unsuitable pedestrian condition)(Gallin, N., 2001)

Although, recommendations are made to include additional aspects (e.g. aesthetics, safety/security considerations) in determining overall LOS provided, no guidance on how these factors can be quantified is provided (Cerrano, M. et al ,2008).

Pedestrian Reviews (or checklist)

Pedestrian reviews are techniques for assessing the 'user-friendliness' of a proposed or existing walking network or route (London Walking Forum, 2000). Such reviews typically include a number of 'factors' to be measured (either on dichotomous, yes/no or Likert scales- very good to very bad). Examples, of such reviews are provided by the Institute of Highways and Transportation (IHT), 1991; DETR, 2000; National Retail Planning Forum (NRPF), 2002 and the Transport Research Laboratory (TRL), 2006).

In the UK, The Five C's have formed the basis for a suggested checklist for local authorities to assess the overall quality of walking areas (Cerrano, M. et al ,2008). An example of such a checklist is provided in Encouraging Walking (DETR, 2000), which asks five main questions (Is the walking environment Connected, Comfortable, Convenient, Convivial and Conspicicuous), with sub-questions for each of the main headings (see also NRPF, 2002).

The Pedestrian Environmental Review System (PERS, TRL, 2006) is a systematic process to assess the pedestrian environment within a framework that meets pedestrian needs. It is a comprehensive review process whereby each pedestrian route, link and crossing point is evaluated (on 7 point Likert scales) against relevant criteria for the

specific area being assessed. Accompanying guidance is providing for conducting the review and how the scoring system can be used to compare different types of pedestrian environment such as links, crossing, routes, public transport waiting areas, interchange spaces and public spaces (PERS, TRL, 2006). All discrepancies are summarised as to allow the improvement priority and development strategies for the area.

Vulnerable Pedestrian Review developed by the Institute of Highways and Transportation (IHT, 1991) consists of six broad areas (Pedestrian routes/surfaces; Crossing facilities; Lighting; Street Furniture; Access by public transport and Access by car), containing a series of related questions requiring Yes/No answers, with additional space for 'reviews' to add comments. Each specific aspect of the area being audited is assessed in terms of their compliancy (yes/no) according to current UK ergonomic minimum standards (Cerrano, M. et al ,2008).

Community-Based Audits

Community based style audits are fundamentally different from reviews in that the evaluation involves actual users of the environment being assessed and are typically evaluated according to qualitative responses (words) rather than physical measurement and/or numerical scales(Cerrano, M. et al ,2008).

In the UK, the most comprehensive guidance on how to conduct a community-based evaluation is provided by the Living Streets DIY Community Street Audit (Living

Streets, 2002). The audit is based around eight main categories, Footway surfaces and obstructions; Facilities and signage; Maintenance and enforcement issues; Personal security; Crossing points and desire lines; Road layout and space allocation; Aesthetics; and Traffic conditions. The guide suggests the types of questions that should be asked as well as guidance on how (and to whom) the results of the audit can be presented.

In the UK, LOS measurement has not been widely used except for the evaluation of high-density areas (e.g. Public transport passenger termini and major road crossing points). The use of pedestrian reviews and community based auditing techniques is more widespread, although, the choice of which method to use varies between different local authority areas. At present, there is no standardised evaluation methodology used and there have been no comparative evaluation (between methods) to examine their reliability (are they measuring the same things?) and validity (do they detect the most important issues faced by pedestrians) (Cerrano, M. et al ,2008).

At this early stage in the research, the following points are emerged in creating a pedestrian friendly environment:

- Public spaces and pedestrian movement in the city centre is seen as the main catalyst in creating pedestrian friendly city.

- Three dimensional design - sturdy relationships between activities, buildings and public spaces. The integrated design for floor plane spaces, integral elements and built edges would determine user to stay longer and enjoy being in the public spaces.

- Attractiveness – fully depending on the pedestrian experience deambulate themselves in the environment which is user friendly. The public edge of the buildings would house activities which is benefit from the interaction with the public realm, and can contribute to the life of the public spaces and its movement network.

- Aesthetic and scale - pedestrian friendly environments would embrace a human scale in its built form. The vertical and horizontal elements should have a balance size for human comfort. Aesthetic value in the built form is also fundamental in enhancing the image and identity of the area.

- Five C principles in the urban network – connections; convenience; convivial; comfortable and conspicuousness reflect the fact that transport users, regardless the mode, wish to make their journeys in the shortest, most convenient manner that is consistent with their personal and road safety and with pleasant and comfortable journey experience.

- Good Design Quality – it is as an assurance to long term cost effective and quality of life for the people. The pedestrian review and audit are believed as an approach that can help to examine the existing conditions in more systematic way. It is important that these approaches are adopted and applied comprehensively and systematically by local highway authorities, architects and urban planners to improve the pedestrian environment.

5 Conclusion and Further Research

The initiatives toward pedestrian friendly city need a comprehensive strategy which involves many parties in the built environment. This includes the creation of attractive city squares and public spaces, the role of pedestrianisation, additional measures to restrain traffic, the harmonisation of walking and public transport and improved safety and security for pedestrians. The urban environment somehow needs to achieve certain quality as to assure it successfulness in meeting the quality of life. Researchers suggested for an integrated approach in assessing the quality in order to reduce the environmental uncertainty facing by the decision makers in the development and infrastructure industries (Curwell et al., 1998). Comprehensive knowledge and ideas exemplifies from this integration are believed could lead toward sustainable urban development and community.

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The development of a conceptual model for place branding

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Abstract:
There is a growing body of literature on place branding. However, empirical research and critical discussion is needed to support the place branding approach and to extend the concept beyond the narrow focus of a perceptual entity or image to include behavioural dimensions. The purpose of the paper is to describe future research which includes adapting an existing conceptual model and piloting its use in a study of branding Manchester as a knowledge city. The proposed model redefines relationships amongst stakeholders and focuses on their behaviour. The research described aims to test the impact of these relationships on the development of a place brand. Findings from the pilot study will contribute to my research which is focused on the development of theoretical model for successful branding of Manchester. The work also aims to offer useful guidelines for the development of successful brands.

Keywords:
Brand relationships, place brands

1 Introduction

Branding is not a brand new idea. According to Finucan (2002) more than a century ago British Prime Minister Benjamin Disraeli noted that "a great city, whose image dwells in the memory of man, is the type of some great idea. Rome represents Conquest; Faith hovers over the towers of Jerusalem; and Athens embodies the pre-eminent quality of the antique world, Art." Furthermore, the identity and reputation of these cities was built over centuries. In contrast, a variety of communication tools enables the spread of a desirable message about a particular city to take place much more quickly today. Nevertheless, "almost all European places are experiencing problems, but some more than others" (Kotler *et al.*, 1999).

City branding is "a discipline that is developing fast" (Van Gelder and Allan, 2006). It became very popular recently and copious literature now exists. Nevertheless, "knowledge of destination branding remains poorly understood and is often misunderstood by practitioners" (Blain *et al.*, 2005), "research on destination branding has been given insufficient attention to date" (Tasci and Kozak, 2006). Cai (2002) claims that whilst branding is expanding into tourist destinations this concept is not studied or practiced as vigorously in the general field of destination marketing.

Klingmann (2007) declares that nature of branding has changed significantly from the symbol of production (traditional meaning) to “means of providing the customer with a certain identity”. For places the basic function of a brand or branding is to distinguish its identity, both personal and social (Klingmann, 2007). Notwithstanding Hankinson (2004) argues that such conceptualisations limit the development of place brands and suggests looking at place branding as a relationship with consumers and other stakeholders focusing on behavior and reality. Trueman *et al.* (2007) suggests using a stakeholder perspective when identifying and differentiating city from its competitors and apply an integrated “warts and all” approach in city brand marketing as local communities, built environment, heritage and infrastructure form the image of the city. It is the purpose of this paper to address this issue, and to apply a “warts and all” approach to Manchester.

Manchester is an international city in the global economy. Its aim is to generate more jobs and so it has to sell itself in order to attract business, tourism, students and key workers. With this in mind, the purpose of my research is to find a model of successful branding for Manchester as knowledge city. I believe that this would help the Council and other bodies involved in decision making related to branding of Manchester and other activities to develop more targeted campaigns. My research also aims to examine the brand concept from both demand-side and supply-side perspectives, to identify differences, and, to check how the idea of Manchester as a knowledge city fits with the latest endeavour to brand Manchester, with Saville’s summing up slogan "original modern" and the new logo M for the city, launched by Manchester City Council during the 2006 Labour Party Annual Conference in Manchester. By the way, this is not a first attempt to brand Manchester starting from the 19th century when it was well known as first industrial city (Ruzinskaite and Hudson, 2008).

The paper’s contribution is to review related literature proposing various models of branding. This will then be used to choose the most relevant theoretical model and apply it to Manchester. The paper is in three parts. The first observes different approaches to place branding and summarizes some of the models proposed by other authors. The second section provides a description of the general model of place branding as developed by Hankinson (2004) and the third part describes Manchester from knowledge city perspective giving guidelines for future empirical research. The purpose of this paper is not only to explain future research but also receive suggestions before undertaking a survey.

2 Place Branding Approach

Brands are becoming one of the most valuable assets for places. One of the reasons is competition between cities. Moreover, they compete with other global places as well. “As cities fight over the scarce resources of talent and investment they are turning to branding to find competitive advantage” (Virgo and de Chernatony, 2005). According to Klingmann (2007) cities have diversify their economic base to be able to adapt to changing conditions when they strive to gain the attention of multinational corporations, tourists or potential inhabitants. City branding is often employed when there is a need to renew city’s image and to eliminate existing negative perceptions (Kotler *et al.*, 1999).

Manchester can be taken as an example – the city prospered as an industrial city but decline meant that it had to redefine its identity (Ruzinskaite and Hudson, 2008).

Like products and services, places need to be marketed as well (Kotler *et al.*, 1999). As city branding has grown out of marketing science (Ashworth and Voogd, 1990) it uses techniques associated with the creation of classical product brands (Hankinson, 2007). A brand is formed by a name, term, logo, sign, design, symbol, slogan, package or combination of these (Cai, 2002). However, city branding differs from traditional product branding. Virgo and de Chernatory (2005) give several reasons for this: the lack of control over the city experience, the mutating nature of the target market (groups differ from each other but branding targets all of them) and the variety of stakeholders and steerers. There are similarities between product and city branding as well as differences. Firstly it should be noted that a city is branded to distinguish it from all others as "in the marketplace...", whilst "...companies use branding to distinguish their product from all others" (Finucan, 2002). City branding can deliver a new message to the world about the city (e.g. Liverpool is the Capital of Culture 2008). "Strong brand can confer enormous power" but "it must be carefully built, and maintained" and "brand must always deliver value" (Randall, 1998). These statements apply to both product and city branding. However, "unlike typical goods and services, the name of a destination brand is relatively fixed by the actual geographical name of the place" (Cai, 2002).

Aaker in his book "Managing Brand Equity" (1991) cites Stephen King, WPP Group in London "A product is something that is made in a factory; a brand is something that is bought by a customer. A product can be copied by a competitor; a brand is unique. A product can be quickly outdated; a successful brand is timeless." "A successful brand must accurately reflect the image and experiences of the destination" (Blain *et al.*, 2005). The American Marketing Association defines band as 'a name, term, sign, symbol or design, or a combination of these, intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors' (Kotler, 1997). Van Gelder and Allan (2006) say that city branding is "a shared responsibility and practice of the city's main stakeholders" and it is "not something that is the sole preserve of local government". Finucan (2002) in her publication cites Maureen Atkinson that "a brand is type of shorthand for a product" and "what you try to do is create that shorthand, so that when people think of your city, they automatically think of what is best about it". This suggests that not only symbol, slogan and logo create the brand of the city. Architecture, environment, people, services, language, myths, legends, perceptions, heritage, everything has impact when creating the brand for the city. It is the whole experience. Furthermore, Hankinson (2004) states that "successful branding of destinations results from a combination of imaginative marketing supported by investment in the key services and facilities required to deliver the experience on offer".

In an attempt to clarify destination branding from both theoretical and empirical perspective Blain *et al.* (2005) have reviewed the conceptual and theoretical underpinnings of branding and carried out a survey of a particular subset of destination marketing organizations (DMO). As a result they have presented a revised and improved definition of destination branding as follows: "Destination branding is the set of marketing activities that (1) support the creation of a name, symbol, logo, word mark or other graphic that readily *identifies* and *differentiates* a destination; that (2)

consistently convey the *expectation* of a memorable travel *experience* that is uniquely associated with the destination; that (3) serve to *consolidate* and *reinforce* the *emotional connection* between the visitor and the destination; and that (4) reduce consumer *search costs* and *perceived risk*. Collectively, these activities serve to create a *destination image* that positively influences consumer *destination choice*."

In order to brand a destination, Cai (2002) suggests that image must be built by choosing an optimal brand element mix and identifying the most relevant brand associations and proposed a conceptual model of destination branding centering on building destination identity and investigated the use of "cooperative branding across multiple rural communities". His study is "expected to assist DMOs in aligning important marketing strategies with its image and identity building and vice versa".

As some confusion exists in the literature about the concept of a "brand" in the tourist destination context Tasci and Kozak (2006) carried out the study "to explore how experts perceive the meaning of destination branding and its main characteristics" and proposed a model of branding in the tourism destination context which consists of offered and received brand, its meanings and assets. The size of fit between these offered and received brand would describe success of destination marketing activities.

Hankinson (2004) elaborated on the concept of destination brands declaring them as relationships and summarized them as "the match between destination image and visitors' self-image, or a match between the brand and consumers, where consumer's needs and brand's symbolic values and functional attributes match" (Tasci and Kozak, 2006). I have chosen this model to test on Manchester as, in my opinion, it is the most inclusive model and fits the Manchester case best.

3 Conceptual Model of Place Brands

Hankinson (2004) has carried out a literature review analysis including classical branding theories, relational exchange and the network marketing paradigm and identified "four main streams of brand conceptualization":

- Brands as communicators - "a brand represents a mark of ownership and a means of product differentiation manifested in legally protected names, logos and trademarks".

- Brands as perceptual entities - "brands appeal to the customer's senses, reason and emotions", "to the consumer, the brand image is characterized by a set of associations or attributes to which consumers attach personal value".

- Brands as value enhancers – it "has led to the development of the concept of brand equity", "brands operate as risk reducers and reduce search costs".

- Brands as relationships – "the brand is construed as having a personality which enables it to form a relationship with the consumer".

Based upon his research, Hankinson (2004) then developed a general model of the place brand which is based on brand networks (Figure 1.).

In the centre there is the core brand defined by personality, positioning and reality. The core brand is surrounded by four categories of brand relationships: consumer, primary service, media and brand infrastructure relationships). “These relationships are dynamic” (Hankinson, 2004). Furthermore, they support the core brand and interact with each other. All this ensures the success of a place branding.

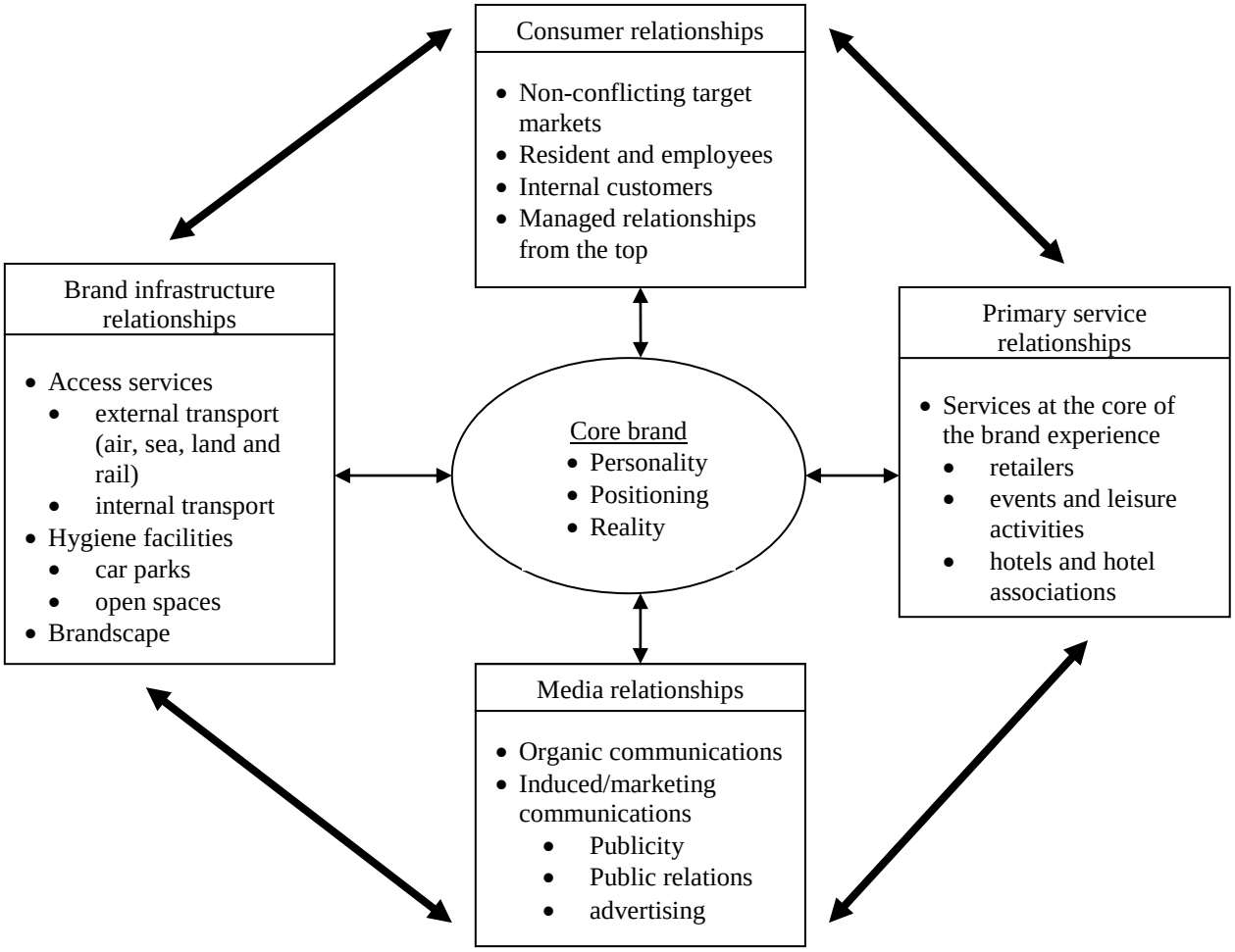

Figure 1. The relational network brand
(Source: Hankinson, 2004)

4 An Empirical Perspective on Manchester as a Knowledge City Branding

4.1 Manchester Knowledge City

Nowadays the knowledge economy contributes significantly to economic growth. Furthermore, it is believed that the “knowledge-based economy” will help to match the growth levels of the US and emerging Asian countries (Winden *et al.*, 2007). Duffy’ (2008) sees the future city as depending upon the social logic of the knowledge economy “which will be aided by technology but that will also continue to be social, plural and face to face”.

Manchester is being transformed from "cotton mill" to "knowledge mill" (Ruzinskaite and Hudson, 2008) so Manchester's initiatives and strategies are focused on knowledge and intangible assets. Universities together with other research institutions contribute to new knowledge and technological innovations. Manchester has Britain's largest (90,000 students) and the fastest growing student population and is a home to three universities (Manchester University (including UMIST), Manchester Metropolitan University, and Salford University). Based on the number of Nobel prize winners to graduate, the volume of research published and other academic achievements, Manchester University is ranked as 40th best in the world which means it is up eight places from last year, leaving it ranked fifth-best in Britain and sixth-best in Europe (Qureshi, 2008).

World-class research in higher education, well-established innovation rich business, international communications and transport, a cultural, residential environment that is attractive to knowledge workers, a flexible infrastructure to grow and ability to retain graduates, all form a strong foundation in Manchester's economic development from a science base (Manchester: Knowledge Capital, 2005) and gives the city an excellent background for the Knowledge Capital initiative within Manchester city region which was launched in late 2002. Moreover, the Government has named Manchester as "UK science city" (Manchester: Knowledge Capital, 2005).

Manchester: Knowledge Capital is partnership of four universities, 10 metropolitan authorities and key public agencies (The Northwest Regional Development Agency, MIDAS, Government Office for the North West, Greater Manchester Learning and Skills Council, Manchester Enterprises, Greater Manchester Strategic Health Authority) and its role is to support this new status of Manchester city leading the Manchester's science city's programme. The Manchester Knowledge Capital initiative aims to position Manchester internationally as a city of knowledge economy contributing not only to the growth of knowledge-based businesses but the growth of the region and nation. A Strategy for Greater Manchester published by the Association of Greater Manchester Authorities outlines a number of areas where economic development across Greater Manchester can potentially benefit in the future from the Knowledge Capital concept:

- "New incubators, workspace and spin-out/spin-in activity linked to Higher Education institutions;
- Linking strategies for growth sectors (environmental technology; life science industries; medical equipment and technology; financial and professional services; tourism and cultural industries; computer and internet based industries; creative industries; media, advertising and public relations; aviation; waste reuse and recycling) to Higher Education research and development specialisms; and
- Increased cooperation, connectivity and support between all Higher and Further Education institutions to provide the skills and expertise needed to grow the economy, for example, Bolton Institute plays a leading role in the textile technology research."

To drive forward the knowledge economy with the intention of creating 34,000 jobs in the south of Manchester city centre a new development agency the Manchester City South Partnership (formerly the Oxford Road Partnership) has been set up which

includes Manchester City Council, the University of Manchester, Manchester Metropolitan University and the Central Manchester and Manchester Children's University Hospitals NHS Trust and the North West Regional Development Agency (Hughes, 2008). The universities and the Health Trust are currently undertaking investment programmes worth £1.5 billion. The City South Partnership covers almost 600 acres and stretches in all directions from Oxford Road, from Peter's Square in the north to Whitworth Park in the south, and across from Cambridge Street to Upper Brook Street.

Manchester Science Park falls into the City South Partnership area which is a key partner in the Manchester: Knowledge Capital initiative. Manchester Science Park actively participates in knowledge transfer between universities and private companies. It is a partnership between the City of Manchester, its universities and the private sector. Manchester Science Park operates over three sites in Manchester and not only accommodates over 100 companies and 1000 people but also provides added-value services for companies in high technology sectors. Manchester Science Park works to enhance the economic and technological wealth of Manchester providing nearly 20,000 sq m (215,320 sq ft) of laboratory and office space. It has been named as the "Outstanding Member Park" at the annual UK Science Park Association (UKSPA) conference in 2007 for its services to tenants and the local community, the contribution to the success of the City of Manchester and for its excellent environmental policies.

4.2 Empirical Research

In an attempt to provide some insight into current Manchester branding initiative and to apply the earlier described conceptual model of the place brand to Manchester as a knowledge city, first of all, I will consult with organizations participating in Manchester brand creation (Marketing Manchester, Midas, Manchester: Knowledge Capital) with the aim to get information which will enable me to describe dimensions of the proposed model. Parameters of a conceptual model include:

I. Core brand:

- In the model the core brand represents identity of place which in the case of Manchester as a knowledge city. It is the vision for the city and can be described by three elements: personality, positioning and reality.

- Personality Hankinson (2004) characterizes by functional (tangible), symbolic (intangible) and experiential attributes (Table 1.):

Table 1. Components of Manchester brand *personality*:

(Source: Hankinson, 2004)

Potential functional attribute
- Museums, art galleries, theatres and concert halls
- Leisure and sports activities and facilities
- Conference and exhibition facilities
- Public spaces
- Hotels, restaurants, night clubs and entertainment
- Transport infrastructure and access

Potential symbolic attributes

- The character of the local residents
- The profile of typical visitors (eg age, income, interests and values)
- Descriptors of the quality of service provided by service contact personnel)

Potential experiential attributes

- How the destination will make visitors feel (eg relaxed, excited or fascinated)
- Descriptors of the built environment (eg historic, modern, green and spacious)
- Descriptors related to security and safety

2. Positioning consists of:

- Attributes which make Manchester similar to other places
- Attributes which make Manchester a unique city.

3. *Brand reality* means that personality and positioning have to be fulfilled and exist in reality not only in vision so marketing of image has to be supported by investments of appropriate services and facilities.

II. Four categories of relationships: primary service, brand infrastructure, consumer and media:

1. Primary services include:

- Retailers and retailer associations
- Hotels and hotel association
- Events and leisure organisations
- Organisations responsible for the management of historic monuments and buildings.

This section should give answer to questions like what are the expected behaviours, how are the brand values communicated, how are enquiries and complaints dealt with.

2. Brand infrastructure:

- Access services:
  - external transport (air, sea, land and rail)
  - internal transport (park-and-ride, walkways)
  - Hygiene facilities:

- car parks
- toilets
- baby-changing facilities
- street cleaning
- Brandscape (refers to the built environment)

3. Media and communications:
    - Organic communications (arts and education)
    - Induced/marketing communications
    - publicity
    - public relations
    - advertising
4. Consumer groups:
    - Non-conflicting target markets
    - Residents and employees
    - Internal customers
    - Managed relationships from the top

In order to understand general perceptions about the Manchester brand and get an overall view, it would be also useful to carry out a survey with local residents and businesses, visitors, as well as organizations involved in Manchester branding initiatives taking part. As a survey instrument, a questionnaire should be used, comprising of a mixture of "open" and "closed" questions, based on knowledge on Manchester as a knowledge city, branding initiatives for the city of Manchester and related literature. Responses should be grouped then into a number of general categories. My questionnaire will be in two parts in order to understand general perceptions about the Manchester brand and to enable me to get practical information for me to apply the conceptual model for Manchester as a knowledge city.

Some of the questions which Blain *et al.* (2005) have used in their survey of a particular subset of destination management organizations (DMOs) could be used. These could include rating the importance of the Manchester logo, reasons for the logo design, and logo use. A 5-point Likert-type scale measuring responses from 1 (not at all) to 5 (a great extent) will be used for rating.

Respondents should also be asked which aspects of the city they find attractive or unattractive (Trueman *et al.*, 2007), to give their first thoughts when thinking of

Manchester, and to describe what they understand about Manchester as a knowledge city. Results will be then analyzed using qualitative methods based on frequency of responses and presented in an academic paper.

5 Conclusions

This exploratory paper has reviewed contemporary approaches to place branding and conceptual models presented by other authors. As Hankinson's (2004) model seems to be most inclusive, it has been decided to apply it to Manchester as a knowledge city. Manchester has transformed from industrial city depending on manufacturing to a knowledge-based economy and is now the largest and fastest economically growing city outside London and the economic powerhouse in the North West of England. But it does not stop here and by 2015 Manchester aims to be a world class city and be in the TOP 10 European business cities.

Hankinson (2004) suggests looking at the brand of a place as a relationship with consumers and other stakeholders focusing on behavior and reality and proposes a conceptual model of "relational network brand". He explains that "the ultimate success of a place branding strategy relies on the effective extension of the core brand through effective relationships with stakeholders, each of which extends and reinforces the reality of the core brand through consistent communication and delivery of services". Relationships are grouped into four categories: primary service relationships, brand infrastructure relationships, consumer relationships and media relationships.

A case study approach, incorporating a review of information in the public domain and analysis of the content of promotional material, will be employed to test the proposed conceptual model on Manchester as a knowledge city and assess the city's most recent branding exercise. It will be a single case study because of the complexity of issues in one model.

Consultations and further research will clearly be necessary to describe the parameters of the model. I will be able to identify gaps in the knowledge available. To fill them and get missing practical information, a survey could be used. It is expected that the collected information will also provide some insight into whether the current Manchester branding initiative reflects the knowledge capital concept. Results of the research should show how the idea of Manchester as a knowledge city fits with the latest attempt to brand Manchester with Saville's summing up slogan "original modern" and the new logo M for the city, launched by Manchester City Council during the 2006 Labour Party Annual Conference in Manchester.

The outcomes of the research will then be developed to serve as a springboard for creating a successful model of branding which should improve the theory and practice of place branding. This should provide a dynamic basis for creative new directions in the research of place branding. The initial findings will identify both the potential for achieving success in branding activities and also the challenge of addressing the complexity of multidimensional interactions in practicable place branding solutions.

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Black and Ethnic Minority (BME) participation in community regeneration: a case study approach

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Abstract:
Black and Minority Ethnic groups (BMEs) represent between 8-10% of the UK population according to the 2001 census and the figure is still rising. Many government publications have shown that BMEs groups are very widely spread all over the country but concentrate in some areas more than the others. Another noticeable feature in the BMEs' settlement pattern is that they are overrepresented in neighbourhoods suffering from chronic deprivation and social exclusion. The problem with these areas is more than just the physical deterioration of the environment or the residents are socially excluded from the rest of the country. Therefore, there is a need for the NDC (New Deal for Communities) initiative which aims to curb social exclusion and deprivation by reducing the gap between these rundown areas and the rest of the country. Systematic and effective consultation with the members of these communities must also be advocated as much as a possible in order to achieve the much needed community regeneration. Current studies show that many local councils have developed regeneration frameworks all including the community residents, but because BMEs are diverse in their housing needs, a generic inclusion plan might not totally be effective for them. This paper aims to highlight some of the current housing issues confronting BMEs, describe the many proposed levels at which the community members can be engaged in the community and finally propose ways of getting the BMEs to participate more in community regeneration by comparing previous studies in the field.

Keywords:
BMEs, Community Participation, Community Regeneration, Housing Needs

1 Introduction and Background

The problem of neighbourhood decline, social exclusion and community degeneration and subsequent need for community regeneration is a worldwide phenomenon (Handlery 2005). Most advanced countries are faced with in-migration, ethnicity concentrated neighbourhoods, ethnicity barriers and oftentimes ethnic minority non participation. Ethnic minority communities are a vital part of any countries economy and that is evident in how developed countries strive to resolve issues involving

minority communities. With an estimated population of 305 Million (US Census Bureau, 2008) the US, had $5Billion earmarked for the HOPE VI project which aimed to reduce the gap between the well-paid and the low-paid, the employed and the unemployed and coincidentally, the minority groups who usually live in ghettos where unemployment and crime are reaching for an alarming level. Germany has less than 9% minority population (Worldfacts, 2007) and has the "Urban Development Support" scheme which aims to turn the country's declined communities into 'Socially Integrative Cities' (SIC); and in the case of Sweden, with 12% of the total population being immigrants (Bask, 2005), they employ an approach to community regeneration called the 'metropolitan policy'. Although the neighbourhood decline problems of UK might not be on the same scale as due to population differences, it is obvious that no matter what the population of minority population of a country is, there is a need to engage them in the plans for their community's regeneration and revitalisation. Previous works by Arthurson (2001), Milligan, et al (2006) and Dekker (2007) has all revealed that architectural designs and monumental buildings are not alone to regenerate a community, the people who reside in these communities are very vital to the regeneration plans. To this light, this paper will be looking at how the UK can engage more with the BME population especially in the communities where regeneration is planned, past researches into 'who a BME is', 'what the BMEs housing needs are', and 'why BMEs fail to participate in regeneration' will be reviewed. A case study approach will be adopted to review these past researchers and the emerging themes will used as bases for future PhD research.

This research aims at reviewing the place of BMEs in community regeneration, to achieve this, a number of specific objectives are been considered:

- To review the literature on regeneration as it concerns 'people' and 'place'
- To identify who a BME is and not
- To review the current housing situations facing the BME in the UK
- To examine the various levels of community participation
- To highlight some BME focused regeneration projects in the UK and its effect on the concerned communities.

2 Literature Review

Regeneration is the attempt to reverse that decline by both improving the physical structure, and, more importantly and elusively, the economy of areas (JRF, 2000). McGreal et al (2004) attributes regeneration to mean both the economic and physical renewal of locations with development and investment in property as a fundamental part of both the process and product, (Diamond and Southern, 2006) are of the opinion that it is an ambiguous term as it seems to tend to rescue the world. Robert and Sykes (2000) took a more in-depth approach by defining Urban Regeneration as a comprehensive and integrated vision and action which leads to the resolution of community problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change.

However, the UK government's point of view is that;

> *(Urban) regeneration is about jobs: their creation, protection, quality and skills and the accessibility to various groups within society. It is also about*

> *investment: in businesses, in the urban infrastructure of roads, railways, airports and in facilities like shops, tourists' attraction, sports and cultural facilities. Finally, it is about wealth: the generation of profit, of income, of resources and how these are distributed between rich and poor area, and groups. It is a highly political discipline: it is about people and power (*DETR 2000 in Tsenkova 2002)

The government from the above definition places an importance on keywords such as society, culture, poor areas, profits and politics. Going by all the above definitions, it is lucid that regeneration is about people as well as place, infrastructures, vision, culture, profit and groups, and in putting the definitions and regeneration together, it can be concluded that community regeneration is

> *"a comprehensive and integrated vision and action involving a group of people regardless of background who engage and communicate together to seek a lasting solution to an area's economic, physical, social and environmental condition by creating a liveable environment with infrastructures, investments and safety whilst giving the power of decision to the residents"*.

In the UK, communities are very diverse both in terms of places (i.e. councils, wards, neighbourhoods etc) as well as the people, Baker et al (2000) reports that over 250 languages are spoken on the streets of London alone, making it the most multilingual capital in the world. The people of the UK can be broadly divided into 2, i.e. 'Whites' (or White British) and 'Non-Whites', for all that, in all of the UK, the Non-Whites are only ranging from between 8-10% according to which source is been followed. These Non-Whites people referred to here are also called BMEs (Black and Minority Ethnic) groups. According to a research by the Cambridge Center for Housing and Planning Research (CCHPR) in 2008, it was revealed that in the UK, the proportion of the population ethnically classified as 'White British' has fallen. The report further added that this trend is likely to continue into the future, partly because the part of the population classified as White British is generally older and the natural population growth of this group is slower, and partly because of immigration and emigration.

After five decades of settlement, Britain's black minority ethnic population is still disproportionately concentrated in the poorest urban (usually inner city) locations and in the most deprived housing (Phillips 2003). According to the Social Exclusion Unit (SEU) (2001), there are deprived wards in every region, but the highest concentrations are in four regions:

- The North East (19% of the most deprived wards
- The North West (25.7 %)
- London (18%)
- Yorkshire and Humberside (9.4%).

The proportion of the regional population living in the most deprived wards in these regions is 35.9 % in the North East, 28.4 % in the North West, 18.8 % in London and 21.6 % in Yorkshire and Humberside. 82 % of the most deprived wards are concentrated in 88 local authority districts.

While there is nothing to compare with the scale and deprivation of the North American ghetto, black minority ethnic clusters in Britain are well defined and show few signs of disintegrating. The clusters vary in size from single blocks of flats on social housing estates (as may be found in many of the London Boroughs) to extensive tracts of owner occupied nineteenth century terraces or back-to-backs in inner areas, typical of northern cities such as Oldham, Bradford or Leeds. Table 1 however, further corroborates the geographical representation of the problem areas and their ethnic age and employment representations.

Ethnic minority (%)	Retired (%)	Under-16 (%)	
Sandwell	29.9	18.6	22.8
Bradford	45.8	14.8	19.1
Nottingham	27.3	7.6	14.6
Manchester	5.0	15.6	26.4
Middlesbrough	2.6	14.1	25.2
Newham	33.3	14.3	24.2
Tower Hamlets	73.0	13.0	34.0
ENGLAND	5.9	18.2	20.5

Table 1 Diversity in Minority Areas (Source, SEU 2001)

The table above shows the diverse range of people who live in some deprived neighbourhoods which were selected as pathfinders for the New Deal for Communities (NDC) programme. In particular, it demonstrates the over-representation of ethnic minorities and young people, comparing table 3.0 with 2.0, less than 8% of the UK population are BME but in the worst affected areas like Tower Hamlet, over 70% are from the BME community. This shows the need for a concern about the welfare of the BME.

DCLG in 2007 in its Housing Progress Report highlighted some facts about BMEs in the UK as shown below

2.1 BME Housing Issues- Facts

- Rates of overcrowding and dissatisfaction with housing have continued to decline steadily among the minority ethnic population since 1996-97.
- The greatest improvements have been among Bangladeshi and Pakistani households (although in recent years, dissatisfaction with housing has started to increase among Bangladeshis).
- Between 1996 and 2004 the proportion of minority ethnic households living in non-decent homes fell from 52 per cent to 33 per cent.
- Minority ethnic households are over-represented among homeless households in England, but the number of minority ethnic households accepted as homeless decreased by around 30 per cent between 2003-04 and 2005-06. The latest figures estimate that the number of minority ethnic

households accepted as homeless in 2006-07 was 15,110, a reduction of just fewer than 50 per cent since 2003-04.

- Despite improvements in rates of overcrowding, between 1996-97 and 2005-06, the rate for all minority ethnic groups was consistently higher than for White households. Overcrowding rates were consistently highest for Bangladeshi households and lowest for White households (27 per cent and 2 per cent respectively in 2005-06).
- Despite improvements in satisfaction with housing, minority ethnic households as a whole have had consistently higher levels of dissatisfaction than White households (13 per cent and 5 per cent respectively were dissatisfied in 2005-06).
- Bangladeshi households (24 per cent) and Black African households (21 per cent) were the most dissatisfied in 2005-06, as they have been in each year since 1996-97.
- In 2005-06, Bangladeshi and Black African households also had the lowest levels of owner-occupation, at 36 per cent and 24 per cent respectively. These proportions were very similar in 2004-05.
- The proportions of people from different BME communities having a household income of less than half the national average are 34% of Chinese people, 40% of African Caribbean and Indian people and over 80% of Pakistani and Bangladeshi people. These figures compare to 28% for England and Wales as a whole.

According to the Association of London Government (2008), nationally, BME groups are over 6 times more likely to experience overcrowding than white households. The ODPM research has shown that BME households are still around twice as likely to be overcrowded even if we take account of household size region and tenure.

This section has shown that community regeneration is majorly about a place but equally about the people of the place, the population diversity of the UK has been mentioned and the proportional significance of the BME group has been noted. Also of note is the seeming overrepresentation of the BME groups in the lowest rated areas of the country and the appalling housing conditions that they face. Going back to the agreed definition of community regeneration, it has to be integrative and comprehensive; involving the community members i.e. there is a need for the people to participate in the process. In this light, the next section will examine the levels of community participation possible and consequently identify the best level at which members of the BME community should participate in order to facilitate community cohesion.

2.2 Factors that Facilitate Community Cohesion

There are many factors that contribute to community cohesion (Forest and Kearnes, 2000). Gaster and Crossley (2000), Burton (2003) and Pemberton et al (2006) all identified community participation as one of those factors. However community participation can take many forms and many involve a diverse range of activities. This section will look into the basic form of community participation and the various levels therein will be identified.

2.3 Community Participation

According to Dekker (2007), community participation is defined "as activities undertaken by residents with the aim of positively influencing the social and physical situation of the neighbourhood. It is the extent to which the residents of a community can affect the final decision. Participation can be either 'formal' or 'informal'. According to Dekker (2007), participation may take the form of active involvement and engagement in community regeneration initiatives, for example, giving feedback on consultation issues and attending community planning meeting. It can however be less formal, for instance, participants may just be in the background and undertaking little activities as posting fliers of events planned without any serious commitment.

2.4 Levels of Community Participation

There are different types and levels of participation, (Wilcox 2003, Dekker 2007). According the CIH report by Lister et al (2004) they can be classified as involving activities such as *Informing* telling people about the pathfinder and what it plans to do, and engaging their interest in it, *Consulting* which involves offering people options, getting feedback from them and taking account of their views, *Deciding together* encouraging people to develop ideas or options, and giving them some influence in deciding the way forward *Acting together* joint decision-making on action to be taken, and forming partnerships with residents' groups to carry it out and finally, *Supporting independent community initiatives* i.e. helping residents to carry out their own plans or initiatives for example by grant-aiding or in other ways supporting them, while leaving them in charge of what happens. Michener (1998) added that participation in terms of community development can also either be 'planner-centered' or 'people-centered'. Deshler and Sock (1985) in Michener (1998) identified 2 levels of participation. The first level is "Genuine Participation" which includes 'empowerment' and 'cooperation', while the second level is Pseudo-Participation. Pseudo-Participation was broken further down into 2 sublevels; assistencialism and domestication. Domestication which is about therapy, information and manipulation of the people is the lowest level of participation while 'empowerment', which involves 'citizen control' is the highest level of participation.

3 Research Methodology

This research is a part of an ongoing PhD on 'BME in Community Regeneration'. It is aimed at highlighting the effectiveness of BME participation and inclusion in community regeneration with an eye on the current situation of BME housing conditions and needs. To achieve these, relevant literature will be vastly reviewed to differentiate BMEs from Non BMEs, also past research on the housing conditions of BMEs are reviewed. This research will take the form of a case study by consulting government publications and officials in view of getting an overview of the practices of different local councils and communities who had effectively engaged the Black and Ethnic Minorities community members in their past or present regeneration activity.
The overall PhD research itself adopts an inductive approach of reasoning which according to Babbie (2007) is a research approach that tackles a particular problem from the particular to the general; it is also referred to as a bottom-up approach to research. Having focused on a certain set of people popularly referred to as BMEs, this research

will employ the 'case study' methodological approach. Yin (1994) defines the case study research method as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1994, p. 23). According to Soy (1997) "Case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research. Semi structured and structured interviews will also (Soy, 1997, Yin, 1994)be conducted in order to identify some underpinning themes. These emerging themes will then inform the questionnaire design and questions. Overall, the research will use triangulation approach in the data collation and testing. Triangulation, however is a research strategy that applies different research methods to test the same finding (Babbie, 2007). These results thereof will be ranked and subsequently tested in the case study areas.

4 Regional Case Studies

As earlier mentioned, this paper will review three case studies into the intrinsic housing situations of BMEs. The three areas are chosen based on their geographical positions and BME populations. The first is the West Midlands, based on a project by the West Midlands Regional Assembly; the aim of the research was to identify actions that will ensure that BME communities have access to a full range of housing options in the region. The second is Woking Borough Council; their research was focused on contributing towards promoting social inclusion and the development of cohesive and sustainable communities. And lastly, the City of Salford Council; the aim of the Salford council was to review the best value practices on community engagement.

4.1 West Midlands:

Introduction **-** The West Midlands has the highest BME population in the country outside London and this population is still rising. In 2005, the West Midlands Regional Assembly in conjunction with the BME housing Network consulted Ecotec to carry out this project. The project was however a part of a wider theme which was about making recommendations on how national resources should be used for housing investments in the region.

Methodology - Since there has been past research works on the BME, the explicit instruction of the BME housing project was that this research was not to duplicate previous researches. In the course of the research, different stages were involved. Firstly, the 'context was scoped', this helped in looking at the opportunities and challenges affecting the BME housing, both in the national, regional and local context, secondly, 'literature was reviewed' in order to look for examples of good practices in strategic, policy and practical responses to need in BME communities, thirdly, there was 'stakeholders interview' which was undertaken in order to enable the research to be informs by the experience, perception and aspirations of stakeholders with an existing or potential interest in BME communities and finally, comprehensive 'communities interviews'. This was undertaken on a selective basis to gain a better understanding of the housing experiences and aspiration of the BME communities. In order to focus on change, a number of BME groups were selected for interview, carried out through a mix

of focus groups, individual and telephone interviews. These consisted of BME business people and professionals, BME students at Aston, Birmingham and Coventry Universities, Muslim communities in East Birmingham and the Pakistani community in Stoke-on-Trent.

Findings and Recommendation - The findings of the research will be summarised capturing just the key ones especially those that cuts across the board on all the three cases studied. The findings of the research showed that the pattern of settlement was such that thought the BME communities are now dispersing, they are still concentrated in metropolitan areas and also that the Pakistani and Bangladeshi communities are the most concentrated. The housing options available to the BME was also realised to be inadequate. The housing tenure, sizes and types are limited especially since BME members usually has lower than average income levels. On BME engagement, the research found through the stakeholders' interviews that BME communities should be better engaged, it was reported that there is a need both to address BME housing issues within mainstream programmes, whilst maintaining complementary culturally appropriate provision.
The research report concluded that BME housing in the region had to be seen as part of the solution for the future of the region, rather than being a marginal, special needs issue.

4.2 Woking Borough Council:

Introduction- Meeting the needs of the ethnic minority communities is one of the key priorities in the overall Woking Housing Strategy. The strategy aims to contribute towards promoting social inclusion and the development of cohesive and sustainable communities. Six areas of actions (or objectives) were identified but for the purpose of this research, only three will be discussed. The first is improvement of communication with the ethnic minority communities in Woking in order to improve access to services and enhance service delivery, secondly, the Improvement of the links between existing forums in the Borough, bringing together housing providers, community workers and individuals from the ethnic minority communities to act as a 'sounding board' on housing and related issues and thirdly the maximization of the provision of affordable housing, including larger homes, in the social rented and private rented sectors.
Methodology- According to the research priorities, the proposed strategy should reflect the need for a broad-based (also known as 'holistic') approach which should consider previous research works in the borough. To this light, the research opened up by conducting a large scale household survey and subsequent qualitative research in the spring of 2004. Local survey teams were recruited by the consultant research company to interview the residents from a total of 441 ethnic minority households; a questionnaire was also designed covering a range of housing related and community participation issues. This added significantly to the council's understanding of the needs of the BME communities within the council.

Findings and Recommendations- The research findings were divided into priority areas but for the purpose of this paper, 2 of these areas will be discussed. The first is 'communication' and the second is 'engagement'. Language and translation needs were a major need among BME families in the region, 20% of families needed information translated. With the Asian or Asian British being 69% of the total sample space, Urdu

was the most requested language for translation. The need to focus on communication was made even more apparent by the introduction of a contact management system at the Council based on the recommendations of the research. It is also recommended that regular communication methods reviews be made to make sure that the Council receives the views of a broad cross-section of the ethnic minority population, including individuals who have previously had little or no contact with the Council. The second priority is engagement. Although there are above 20 community groups within the council, there is very minimal communication between these groups and the council, in spite of the groups meeting in their respective circles, there is no opportunities for the ethnic minorities' community to meet with the housing professionals to discuss problems and solutions. To this light, a review of the current working link betweens with community organisations is proposed.

4.3 Salford City Council:

Introduction- Salford has a comparatively low BME population than most other Greater Manchester authorities, with the latest figure standing at 3.9% but it however has a 'best value team' on engagement with BME communities. The major theme for the best value review of 2006 was 'community engagement'. The scope of the review was subdivided into three themes as follows; firstly the engagement with geographical communities, secondly, engagement with communities of interest using engagement with Black and Minority Ethnic Communities (BMEs) as a template and finally citywide engagement with Salford's citizens. For the purpose of this paper, we will be concentrating more on the second theme which is engagement with communities of interest.

Methodology- The review was carried out by a multi-directorate review team with a smaller core team undertaking most of the detailed analysis. The research was divided into 5 main areas namely: 'challenge', 'consultation', 'comparison', 'competition' and 'analysis'.

Under 'challenge', the research questions were asked and the main question was "are we engaging with our citizens effectively?" 'consultation' was about contacting stakeholders in the community and also using the enormous resources from past research works, 'comparison' focused finding examples of good practices to compare Salford city council with (there was however a shortage here as there were very few councils with Salford's level of BME representation with equally high level of deprivation. 'Competition' touched on the fact that the many forms of engagement on paper can actually be improved to make a better and more effective engagement. The proposed slogan here was 'less engagement but better engagement'. Finally, 'analysis' used the principles of SWOT which proposes an enhancement of the strengths of the council over its weakness.

5 Case Study Findings and Recommendations

The research although focused on engagement with BME communities, it draws from the previous Peer Review Group's project undertaken in 2004. Both pieces of work identified five key areas for improvement. Action on these is expected to build the foundations for developing cohesion in the city. The five areas are:-

- Developing an overall framework across the council for engaging with BME Communities: during the consultation event, it was endorsed that a citywide forum is needed.
- Developing and updating Information about Salford's BME Communities: a baseline information platform should be developed, it was noted that accurate information on the various BME communities represented in the council should at least be known to the council.
- Strengthening the BME Community and Voluntary Sector in Salford: various short and long term actions were recommended such as mapping of current BME activities and provision of funds for them
- Organisational change: joint working is recommended and also that good practices should be shared across various community groups and government bodies.
- Communication and Information: Salford's BME communities are making a major contribution to the city which needs to be recognised when the image of the city is portrayed, according to Steel (2007), "engaging with the BME community in such a partnership approach to housing needs studies can help foster a sustainable relationship between service providers and the BME community". Especially now that the BME population of the city is growing and it has also becoming increasingly diverse. It is estimated that there are in excess of fifty mother-tongue languages currently in use.

The previous section has reviewed past researches into the problems and circumstances surrounding BMEs and participation in community regeneration. Different methodologies were though adopted by the researchers but nevertheless some themes still emerged which were common to all the studies.
These themes can be summarised as follows:

- *Settlement Pattern and Housing Options*: the West Midlands case study shows that there is still a congestion of BMEs in areas of deprivation, although in Birmingham the research shows that there is a slow but gradual dispersal of the BMEs to the inner city, also noted was the fact that the available housing options to the BME was limited in terms of tenure, size, types etc. Woking Council stresses this as well by stating affordable larger homes as a major area of action
- *Communication and Information*: it emerged that there is a need to clearly communicate government proposal and initiatives to the minority community in clear and comprehensible language without assuming that they all speak English. As in the case of Woking Borough Council where 20% of the BME would have liked their newsletters translated. Salford City Council also noted that communication should cut across the board by including recognition of valuable contribution of the BMEs in the council. The Woking research also shows that there is minimal communication with the BME communities at the moment.
- *Information Update*: an adequate and accessible database of BME community activities and available support is lacking at the moment. Salford city council advocates for this so that the council will be able to know the specific needs of these communities, in the case of the Woking council, a comprehensive survey was made in order for the assembly to get an insight into the requirements and wishes of the BMEs in their council.

- *Strengthening Communities and Overall Inclusion*: Salford City Council research outcome stresses that there is a need to strengthen the BME communities in the council by mapping out some short and long term provision for them and also provisions such as funds for their activities. The West Midlands research advocates for an overall inclusion within the mainstream programs while still maintaining complementary culturally appropriate provisions

6 Conclusion and Future Research

It became apparent from the three pieces of research works studied that presently, the level of BME participation in community regeneration is still at a low level comparing the findings to the literature on the levels of community participation. The findings so far shows that 'informing' and 'consulting' are the 2 lowest levels of participation; and that is where the BMEs in the cases studied still operate. The findings are however not peculiar to these areas alone, they cut across many cities in Britain. The finding from the research also like previous ones notes the need for an improvement on current practices on BME inclusion into main stream planning. To this effect, future work will be conducted into the factors responsible for the themes that had emerged from this paper, the reasons behind the problems highlighted will be further explored and possible ways of overriding them will be proposed and tested within the scope of the research.

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Theme 3

Property and Project Management

Process Problems in Facilities Management: An Analysis of Feasibility and Management Indices

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Abstract:
Investments on construction facilities can be motivated by feasibility and profitability indices of alternative initiatives. However, the potentials of projects to meet prescribed goals are being constrained by risks and uncertainties associated with process challenges and procedural frameworks. This study explores the relationship between feasibility sub-systems and profitability indices of selected case studies. The study concludes with insights into the feasibility indices of project initiation and construction processes as they relate to facility management's goals. From the array of variables provided in the study, analysis shows that design sufficiency, buildability and constructability, operability and sustainability are more responsive to the prospects of profitability.

Keywords: Client, construction process, Facility Management (FM), feasibility indices and profitability index

1 Introduction

Investments in property development are often motivated by several ideals and incentives. These motivations are not limited to meeting personal and immediate subsistence needs. Interestingly, investments in construction property development are being recognized as one of the most profitable alternatives in the business world. This could be strongly linked with the imperativeness reposed in the indices of global infrastructural development associated with meeting housing and social needs. Moreover, the impact of this phenomenon is being triggered in relation to imbalances in population growth and various economic indices. Therefore, the significance of the viability and profitability of construction investments can not be over-emphasized in global wealth (Hildebrandt, 2000; Ruddock, 2000).

In many parts of the world, property development sustains the ethos of meeting private and public infrastructural needs. It also contributes to major variables of economic development like gross domestic product, fixed capital formation, resource employment

and sustenance of systemic innovation, technology and culture (Sullivan et al., 2006). Moreover, global attention to the rapid growth of the economic significance of the real estate sector has been on the increase in last two decades (Chan et al., 2008). Therefore, the performance of construction products is as important as the image or roles of the construction industry in relation to various aspects of larger economy (Egan, 1994).

However, construction facility development processes are characterised by several challenges. These challenges are triggered by the uniqueness of complexities, risks and uncertainties associated with various decision stages in construction facility development and management processes. In the context of this study, construction development process and management are reviewed in two relatively correlated phases, viz; construction process and management; and facility management. Construction process and management include project initiation through functional conceptualization, performance specification and procurement of professional services. Other activities include feasibility analysis, entitlement and approval of concepts by statutory authorities, design drafting and documentation, contracting and construction. On the other hand, facility management entails activities aligned with post-construction utilization and maximization of returns-on-values of construction facilities all through product life.

Arguably, an important challenge of every construction process is to deliver a perfect facility at reasonable cost, within time and without serious operational risks. On the other hand, the management of any facility is aimed at optimising client and end-users' operational and management comfort without jeopardising project goals in terms of economic and structural benefits. However, the economic fulfilment of construction facilities is being threatened as construction processes continue to under-achieve in terms of cost, quality, time, transactional relationship and environmental indices of project performance (Egan, 1994). Therefore, the challenge does not only threaten the image of the construction industry and its capacity to fulfil project goals, it extends to transmitting construction process problems to facility management processes.

This study uses selected case studies to review the efficacies of some of the problems inherited from construction processes which are critical to the performance and capacity of technology, innovation and tools used in facility management processes. Analysis reveals that the values economic benefit, feasibility, profitability and life expectancy of construction facilities and components can be more vulnerable to some critical constraints. Arguably, this may depend on the types of facilities and approach to management because facilities are affected differently under separate variables. For instance, while private commercial facilities can be considered on the merits of returns' propensity, social facilities may only be considered on the bases of public interest. Ustinovichius (2004) also observes that investment facilities can be grouped as residential, commercial, social, industrial and institutional infrastructures.

The study further reviews the indices of feasibility and profitability of privately owned commercial facilities as affected by the challenges in construction processes. The objectives therefore, are: (1) to define feasibility indices of construction property development processes, and; (2) to establish the relationship between feasibility indices and profitability index of private commercial facilities. 10 case studies of recently completed facilities were selected in the Central Business Districts (CBDs) of Lagos

(Nigeria) and Sydney (Australia). There is overarching evidence in this study regarding the wide gap between design conceptualizations, client's expectations and end-users' needs. Thus, documented observations on the relationship between feasibility indices and profitability of construction facilities should spur a paradigm change in traditional design and construction management ethos.

2 Literature Review

Analysis and management of risks and uncertainties are critical in the management of processes and procedures in property development system in construction (Gunning and Hanna, 2001; Akbiyikli and Eaton, 2004). This is because the success of property development processes largely depends on the ability to identify and analyse the vulnerability of project variables to definite and unforeseeable negative indicators (Rahman and Kumaraswamy, 2001). However, the capacity to absolutely predict the factors of risk in feasibility matrix of commercial facilities is very challenging because no two projects are identical (Odeyinka et al., 2008). On the one hand, construction products are affected by different variables – like location, business flows, environment and systems, use and social factors. On the other hand, they are managed under different methods, techniques, systems and tools. Thus, it may be possible to view the viability of construction investments from different perspectives – social, economic, political, environmental, legal, technical, cultural and business flows. Ultimately however, a feasible project should overcome risks, fulfil all fundamental requirements and deliver project goals and specific projections within to time and anticipated targets or milestones.

2.1 Indices of Project Feasibility in Construction

Consequently, feasibility appraisal in property development is a vital procedure that is used to determine the sensitivity of the viability of investments when exposed to certain negative indicators. This depends on the capacity and efficiency of certain tools and techniques used in the identification and analysis of tangible and intangible risk indices in project flows. The conceptualization of these feasibility risk indices can be viewed as matrix groups; project's primary requirement matrix and project expectation matrix. Figure 1 shows the concentric presentation of feasibility appraisal of project development processes in construction in relation to primary project requirement matrix and project life expectation matrix.

Consequently, negative indicators can be assessed as an interaction between primary requirement matrix and project expectation matrix. Primary requirements matrix of projects can be a combination of monetary and non-monetary cardinal constraints that relate to financial, marketability, political, cultural, environmental, technical, and social and sustainability of strength through the project life (Ibrahim, and Nissen, 2003). On the other hand, project life expectation matrix could be a combination of basic investment goals and expectations like buildability, profitability (and allied milestones), flexibility for adaptation or modification, functionality, operability, maintainability, design sufficiency, energy efficiency, project capacity for innovation and technology, and cultural value. Figure 2 presents a concise definition of project life expectation matrix sub-variables.

Moreover, traditional property development processes are fragmented into sequences of interrelated structures or processes (Ibrahim, and Nissen, 2003). These processes are composed of tasks or activities and challenges, which can be related to the long-term structure of project life. These procedural flows enhance the capacity of construction facilities to drive cost benefits and lifetime opportunities in relation to risks, uncertainties and economic constraints. Figure 3 shows the link between project development process flow, activity flow and problem flows in construction.

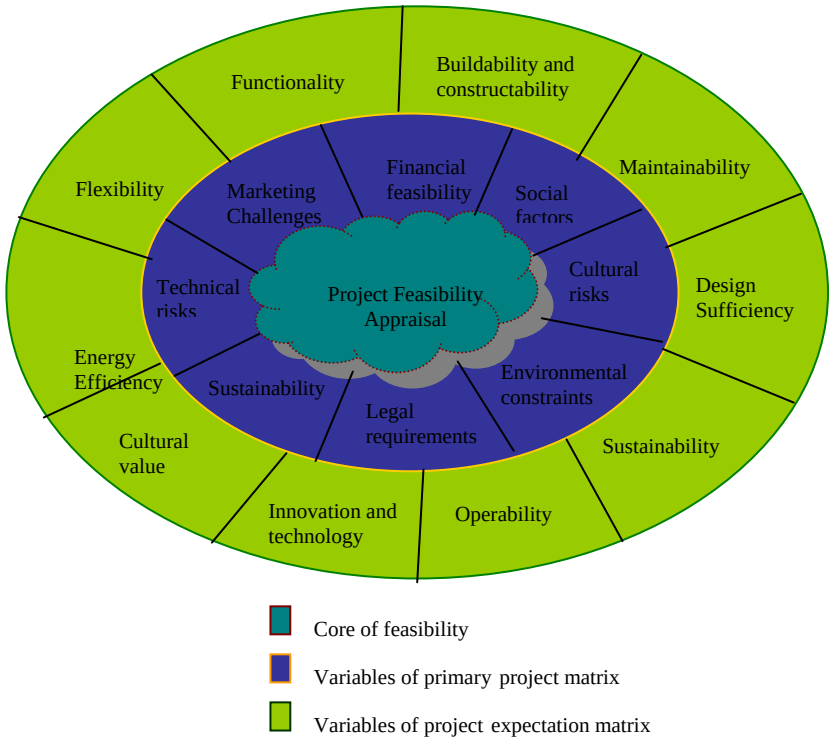

Figure 1: A conentric presentation of feasibility appraisal in relation to primary requirement matrix and project life expectation matrix

Moreover, traditional property development processes are fragmented into sequences of interrelated structures or processes (Ibrahim, and Nissen, 2003). These processes are composed of tasks or activities and challenges, which can be related to the long-term structure of project life. These procedural flows enhance the capacity of construction facilities to drive cost benefits and lifetime opportunities in relation to risks, uncertainties and economic constraints. Figure 3 shows the link between project development process flow, activity flow and problem flows in construction.

However, as much as all projects conceived cannot be seen as viable, many feasible projects may lack the capacity to meet anticipated goals both in terms of cost benefits and the lifetime opportunities they attract (Ankrah and Proverbs, 2005). Consequently, variables of post-construction performance of projects cannot be independent of the significance and justifications of feasibility, sensitivity and cost benefit analyses during appraisal studies. For instance, performances of components are more likely to be

affected by environmental changes and variability in use and conversion than expected, due to the implications of global climate change, uncertainty of population and use forecasts. This in turn could affect the facility management processes and business drivers in terms of change in fashion, value, operability, maintainability, planning and sustenance.

Unfortunately, instead of attributing this challenge to problems partly inherited in construction process and the addressed as such, facility managers are not left with many options than to pay more attention to using information technology to create solutions. Evidently, apart from low cost benefits inherent in contemporary IT-based facility management, the resultant component performance of facilities in terms of functional structure may not reflect any improvement. On the other hand, clients and end-users bear the brunt. This could be linked with discrepancies between upsurge in rental values and the level of end-users satisfaction; coherent spirit of business and cost of disputes; anticipated return and cost of maintenance, and; marketability of facility and public interest. Arguably, profitability of investments in construction facilities and the image of the construction industry can be critically affected by this challenge.

2.2 The Construction Process and Project performance

There is overwhelming empirical evidence justifying the significance of the construction process and associated challenges in property development. These problems affect project performance both at construction and post-construction levels. Unfortunately, there is no empirical evidence that shows strong correlations between poor project performance indices (in term of cost, quality, time, energy, environmental, and health and safety) and post construction performance of construction facilities (considering implication of indices like design sufficiency, buildability and constructability, flexibility, operability, maintainability etc.). However, the implications accumulated inherited problems are evident in the management processes of construction facilities. Therefore, the value and success of Facility Management is better solved as construction processes improve.

In the first instance, the conceptualization of project initiatives are often transmitted by the client to the project team with end-users' requirements or grossly underestimated or not considered at all. This is because, there is little or no evidence of the adoption of a system whereby Facility Managers are dully involved in the current design initiation processes. Unfortunately, the variance between a client's concept of design initiation and end-users' actual requirements are made worse when client's technical brief are overly complex or ambiguous. Kometa et al., 1995) argue the significance of the ubiquitous involvement of client during construction. Therefore, the performance of construction facilities could be very responsive to project initiative. Moreover, the variation between perceived and actual project outlay and performance specification is the single largest factor that is responsible for variation orders, claims, poor cost performance and associated dysfunctional disputes in construction.

1. Design sufficiency *(Acharya et al., 2006; Abrahams and Farrell, 2003)* Efficient design should: •Minimize design errors •Incorporate comprehensive and detailed component specifications •Optimize comprehensive documentation •Maximize capacity for innovation, integrative communication and interoperability	**2. Buildability and constructability** *(Philip, 2002; Cheetham and Lewis, 2001)* Buildable and constructible designs should: •Improve capacity of design to facilitate construction •Motivate capacity of knowledge flow in the construction process to facilitate project goals and building performance •Encourage source-ability of specified components •Facilitate appropriate capacity and resource for construction	**3. Functionality** *(Hammond et al., 2005)* This includes capacity of components to: •Meet the fundamental requirements such as shelter, aesthetics, structural, services, value for money, etc throughout product life •Adequately protect client and end-users against avoidable risks like damp, inclement weather, heat, vegetation etc. •Convey comprehensive identity and purpose of use •Provide structure for space delineation and use
4. Operability *(Bureau of Engineering Project Delivery Manual, 2007)* This can be summarized to mean the capacity of facility components to: •Meet client and end-users' operational needs (like security, stability, firmness etc) •Enhance response to emergencies and operational risks •Enhance sufficiency of space and maximize effective utilization of facility •Enhance optimal accessibility to critical forms of mobility and associated challenges	**5. Maintainability** *(Pheng and Omar, 1997; Kangwa and Olubodun, 2005)* This is considered to include capacity of facility components to facilitate: •The consideration of Diagnostic and retrofitting variables •The provision of reliable benchmark for periodic, scheduled, preventive and corrective measures over time •Sustenance of good maintenance practice •Longer defect susceptibility without compromise to optimize value for money	**6. Cultural value** *(John, 2004)* Culture can be indexical in construction product development processes. However, major indices include the capacity to sustain: •In-use technology and historical sub-systems regarding cultural, experience and practice identities •'Duty of care' to protect public interest •Diversity, social inclusion and responsibility, equity and fairness in public realm and long-term objectives •Fluidity of whole-life values
7. Sustainability *(Adetunji et al., 2003)* This can be summarised as ability of components to optimize, as long-term benefit to client and end users: •Comfort of use and opportunity for re-use •Constructive performance with cost advantage •Safe interaction with the environment and eco-subsystems •Occupational safety and health improvement	**8. Flexibility** *(Gann and Barlow, 1996; Slaughter, 2001)* This implies the whole life capacity of facility to simplify: •Conversion and adaptation •Modernization and improvement •Alteration and extension schemes •Renovation and periodic overhaul	**9. Technology and Innovation** *(Blayse and Manley, 2004; Goyal et al., 2005)* This implies the capacity of innovation and technology to enhance: •The use of appropriate tools for work •Timeliness and value-based delivery of project •Value for money and process objectivity •Total quality performance of all components
10. Energy efficiency *(Bell, 2004)* This includes the capacity of building components to optimize: •Efficient energy use at reasonable cost •Minimization of greenhouse emissions •Performance of services •Adoption of comprehensive approach to energy improvement practices	**Profitability** *(Bello and Bello, 2008)* This includes considerations for: •Low maintenance cost •High gross floor and lettable area ratio •Capacity to attract and enhance business concerns •Location competitiveness and capacity to support basic business functions	

Figure 2: Concise definition of sub-variables of project life expectation matrix

On the other hand, there is stochastic evidence regarding the impact of poor design conceptualization in the construction industry. Ordinarily, an effective construction process is expected to comprehensively reflect a client's desire in relation to end-users' requirement and public interest. However, several approaches in current design processes lack the capacity to express detailed project information. Most times, many design methods are not suitable in terms of detailed component specification and application information within the project team. Moreover, basic design information is not extended to facility managers who manage components' performance and application of spaces. Thus, there is gap between actual component performance and documented information due to several factors that could impact on the performance of design components. However, there are rhetoric claims that Building Information Modelling (BIM) processes have the capacity to address these gaps; considering the influence of virtual enterprise, interoperability, automated quantifications, true spirit of collaboration between project team as well as speed and accuracy of design conceptualizations (CRC CI, 2007). Unfortunately, BIM concepts have not yet been fully adopted in the construction industry.

Furthermore, the selection of appropriate contractors to execute projects as designed is another challenge. For instance, contractors are usually prequalified to ensure value-based and objective selection processes. However, this mechanism does not ensure that the successful contractor will perform as predicted (Olatunji, 2008a and 2008b). In

addition to major extrinsic and intrinsic factors any contracting organization could be subjected to, poor performance by construction contractors could be worsened by dysfunctional competition between contractors and the effects of lowest-bid-syndrome in the traditional procurement system in construction. Moreover, the implication of climate change is evident on the performance of building components, while the consequences of manufacturer's evil can only be imagined than experienced. Given this situation, the involvement of Facility Managers in the construction process is further justified because they possess more reliable facts on the actual performance of building components in use. Their perspective of project goals could also help define appropriate selection criteria that would facilitate an improved construction process.

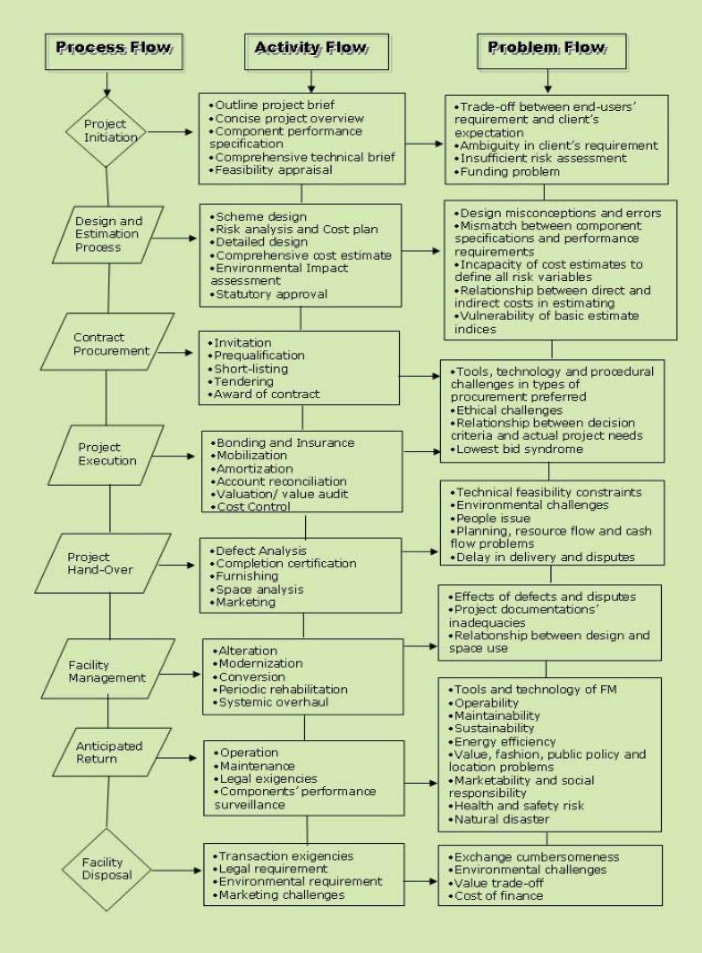

Figure 3: The link between project development process flow, activity flow and problem flow in construction.

3 Research Methodology

Direct observation, in the context of this study, implies the use of case studies to follow rigid protocol in examining limited variables when using in-depth, longitudinal and critical examination of multiple and isolated cases to collect data, analyze information and reports, and at the same time generate and test hypothesis (Marshal and Rossman, 1998). This strategy is more relevant to this study because all construction facilities are not perfectly identical in terms of designs processes and goals. Therefore, to avoid over-

generalization, it is expedient that only few specific cases that share basic similarities which are relevant to this study could be considered. Arguably, these attributes are very common to the conceptualization of all construction facilities. Therefore, observations on the case studies would be relevant in generating more conclusive reports on various investigations on complex and technical issues like relationships and gaps between design conceptualizations and achieving projected goals of construction investments. Thus, this study will rely on robust sources of evidence to benefit from the structures of divers opinions and systems in relation to feasibility indices and profitability of construction facilities.

3.1 Study Method

This study is focused on the investigation of the relationship between project performance matrix and the profitability of construction facilities using private commercial assets. Thus, a list of facilities performance variables and sub-variables are identified from literature - as presented in Figure 2. Moreover, 10 case studies of private commercial properties were selected for analysis through direct observation. The selected properties were constructed between 1995 and 2005. Five of the case samples are located within the Central Business District (CBD) of Lagos, Nigeria; while the other 5 are within the CBD of Sydney, Australia. Although, there may be marginal differences between construction industries within the two countries where the study samples are selected, however, all the samples share very relative construction variables and experience.

Both cities are relative in terms of modern cosmopolitan features. Sydney is classified as a 'beta global city' (Beaverstock, 1999). Sydney is also one of top 20 most expensive cities in the world. The CBD of Sydney portrays very competitive rental costs of commercial properties relative to other parts of the world, with similar statute. With a population of about 10 million, Lagos has a population density of about 8,000 persons per km^2. According to City Mayor Statistics, Lagos is one of the top 10 fastest growing cities in the world with estimated 4.4% annual population growth rate. Thus, as a responsive national business hub, Lagos has modest prospects for commercial property development investment.

Although, both cities may not perfectly reflect the ideals of holistic conceptualization of property development or the structure of global construction industry, however, the indices reviewed in this study can impact on the performance of similar properties with similar market structure in any part of the world. The case studies are selected based on relativeness in construction features, responsiveness in CBD, gross floor area and total lettable area ratio. All the properties are concrete framed structures with an average of about 5,800m2 in 10 Nos floor and 65% lettable area. With an average age of 8 years, all the structures are suitable or purposed for business tenants, considering the location advantages of the facilities within the CBD.

3.2 Analysis

Each case study was assessed based on the matrix of facility performance and profitability variables and sub-variables presented in figure 2, using a scale of 1 to 4; 1 being poor and 4 being excellent. Markedly, there is strong correlation between innovative practices in the construction processes identified and the performance of the

facilities. Construction and post-construction project performance were enhanced by Effective risk analysis, comprehensive project documentation, professionalism, effective communication between parties and information technology. The result of the correlation analysis between project performance matrix and profitability index is presented in Table 1.

Table 1: correlation analysis of project performance matrix and profitability index

Design sufficiency	Pearson Correlation	1.000										
	Sig. (2-tailed)											
Buildability and constructability	Pearson Correlation	.672*	1.000									
	Sig. (2-tailed)	.033										
Functionality	Pearson Correlation	.383	.420	1.000								
	Sig. (2-tailed)	.275	.227									
Operability	Pearson Correlation	.559	.332	-.079	1.000							
	Sig. (2-tailed)	.093	.348	.829								
Maintainability	Pearson Correlation	.566	.603	.570	-.243	1.000						
	Sig. (2-tailed)	.088	.065	.085	.499							
Cultural value	Pearson Correlation	.643*	.564	-.110	.407	.369	1.000					
	Sig. (2-tailed)	.045	.090	.762	.243	.294						
Sustainability	Pearson Correlation	.250	.356	.477	.187	.260	-.145	1.000				
	Sig. (2-tailed)	.487	.312	.163	.606	.467	.688					
Flexibility	Pearson Correlation	.398	.616	.185	.733*	.061	.406	.524	1.000			
	Sig. (2-tailed)	.255	.058	.608	.016	.866	.244	.120				
Technology and Innovation	Pearson Correlation	.417	.545	.662*	.418	.395	.130	.697*	.798**	1.000		
	Sig. (2-tailed)	.230	.103	.037	.230	.258	.720	.025	.006			
Energy efficiency	Pearson Correlation	.496	.327	.155	.206	.287	.241	.515	.270	.329	1.000	
	Sig. (2-tailed)	.145	.356	.669	.569	.421	.503	.128	.451	.353		
Profitability Index	Pearson Correlation	.929**	.753*	.439	.667*	.427	.630*	.292	.571	.515	.323	1.000
	Sig. (2-tailed)	.000	.012	.204	.035	.219	.042	.412	.085	.128	.363	
		Design sufficiency	Buildability and constructability	Functionality	Operability	Maintainability	Cultural value	Sustainability	Flexibility	Technology and Innovation	Energy efficiency	Profitability Index

4 Findings and Discussion

From the analysis presented in Table 1, there is significant correlation between profitability index and design sufficiency, buildability and constructability, operability and cultural value. Moreover, there is strong correlation between Technology and Innovation and functionality, sustainability and flexibility of facility components. There is also strong correlation between flexibility and operability. The correlation coefficients of flexibility and innovation and technology are also fairly responsive. Surprisingly, energy efficiency, sustainability, maintainability and functionality are not very relative to profitability index, as presented in the analysis. Even though there is rapid improvement in global concern for climate change, this study further confirms that there is little attention in terms of business concerns in relation to the implications of climate. Moreover, business relationships in construction property development investments are usually fragmented and short-term in nature. Therefore, the ideals of sustainability in construction have fundamental implementation constraints in commercial properties.

Moreover, the prospects of competitive investment profile in construction may be a good motivator for short-term maintenance efforts. However, as long as maintenance culture in facility management is only motivated by shallow business concerns and not as major construction concern, the performance of construction facility may be under-achieving. Arguably, comprehensive consideration of maintenance variables in the

design process could be the best way to improve the cost and schedule of maintenance in facility management. In addition, the poor correlation coefficient between profitability index and function as reflected in the analysis is a further confirmation of Bello and Bello (2008) survey. The structure of time limitation between transaction parties in facility management, competition and population pull can motivate the choice of any facility for business. Fortunately, to some extent, tenants can be allowed to enhance the temporary functionality of certain facility components. Thus, as long as minimum functional requirements are met, there could be limitations to how this can affect the profitability profile of some commercial facilities.

5 Conclusion and Further Research

This study has established the relationship between construction processes and profitability index of some randomly selected commercial properties. Evidently, Construction and post-construction project performance could be enhanced by effective risk analysis, comprehensive project documentation, professionalism, effective communication between parties and information technology. Moreover, there is significant correlation between profitability index and design sufficiency, buildability and constructability, operability and cultural value. Also, the analysis presented in this study shows that there is strong relationship between Technology and Innovation and functionality, sustainability and flexibility of facility components; while maintainability and energy efficiency could not reflect any relationship with any other variable in the analysis. This further indicates the need to reduce the gap between design conceptualizations in construction and global concerns for energy efficiency and more responsive maintenance culture in future construction facilities. Further studies are thus recommended as follows:

1. There is the need to establish the relationship between rental values of construction facilities and the components of satisfaction derived by end-users
2. There is the need to further establish the benefits of the involvement of Facility Managers early in the construction process
3. There is also the need for stochastic analysis and appraisal of performance information on construction components, sustainability and energy efficiency, considering raising concerns for global change.

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Innovation and knowledge transfer in PPP/PFI projects: a literature review

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Abstract:
Different studies have developed frameworks and models for knowledge transfer and innovation diffusion based on various aspects. A literature review of knowledge management, knowledge transfer frameworks and innovation processes in PPP/PFI was carried out to evaluate the set backs for innovation and knowledge transfer in the construction industry. Factors that promoted improvements in innovation and knowledge transfer are also evaluated in this study. The paper identifies the main obstacles to innovation and knowledge transfer in the construction industry as follows: 1) the pattern of couplings in traditional procurement seems to favour short-term contractual relationship which hampers innovation and learning; 2) lack of coordination among multi-disciplinary project team; 3) socio-political reasons; and 4) financial constraints. The paper suggests that information, knowledge and competence; intra and inter-organisational networks and relationships in projects can stimulate innovation and knowledge transfer

Keywords: PPP/PFI, Knowledge transfer; Innovation; knowledge management, construction industry

1 Introduction

PPP/PFI is a procurement option used in the United Kingdom and in other advanced economies in financing projects but in the United Kingdom is a major procurement strategy used in procuring services in the public sector such as: the ministry of defence, transport, healthcare sector, prisons. The provisions of these services are typically the primary responsibility of the government and PPP/PFI is still perceived as the most cost effective means of procuring services (Pitt, Collins et al. 2006). The use of PPP/PFI in the healthcare sector in the provision of healthcare is increasing in terms of number, capital value and size of projects (Akintoye and Chinyio 2005). However, there is the need to improve the contracting methodology, competence and to transfer knowledge between projects.

The major challenges facing construction organizations are the lack of PPP/PFI experts, longer negotiation periods and tight time schedules to deliver large-scale schemes, high levels of investment and risks involved and limited knowledge transfer between PFI projects (Carrillo, et al. 2006). The absence of reliable information on past PPP/PFI projects (Dixon, et al. 2005; Pitt, Collins et al. 2006) and lack of flexibility and innovation offered by PFI (Dixon, et al. 2005) are negative aspects of the procurement method.

A critical factor claimed for PFI is the ability to bring improved innovation into the project delivery. To date no substantive research has been identified to confirm or refute this claim (Eaton, et al. 2006). However, "the blockage to innovation is the human capital dilemma of insufficient trained persons in innovation management; a second is the paucity of effective organizational mechanisms to realize the full potential of innovations that have been achieved in one environment to transfer them where they are needed in another" (Pohlmann, et al. 2005).

This paper is set to identify the main obstacles to innovation and knowledge transfer in the construction industry and to suggest how best to stimulate innovation and transfer knowledge between projects and to identify positive outcomes of previous studies carried out. The paper is based upon an extensive literature review of knowledge management, knowledge transfer frameworks and innovation process to achieve the purpose of the paper. It then suggests how information, knowledge and competence; intra and inter-organisational networks and relationships in projects can stimulate innovativeness and knowledge transfer. Following the introduction, Section 2 provides the definition of knowledge management and; Innovation; Section 3 discusses Public-Private Partnerships/Private Finance Initiative; Section 4 provides overview of knowledge transfer and innovation processes; Section 5 discusses knowledge management/knowledge transfer in the construction industry; Section 6 identifies the barriers of innovation in the construction industry and; Section 7 provides the conclusion of the paper with some suggestions.

2 Definition of Knowledge Management and Innovation

2.1 Knowledge Management:

Knowledge is viewed as a critical factor for innovation and to enhance the competitive advantage of organizations (Cohen and Levinthal 1990; Nonaka and Takeuchi 1995; Brown and Duguid 1998; Leonard and Sensiper 1998; Hansen, Nohria et al. 1999; Zack 1999a). This has resulted in organizations striving to adopt the principle of knowledge management. Knowledge Management is defined as the identification and communication of explicit and tacit knowledge residing within processes, people, products, and services (Bollinger and Smith 2001) to achieve expected ends. Knowledge Management acts as a possible means to secure the success and viability of an organization by the use of its knowledge assets which is achieved by building, organizing, deploying and reusing knowledge assets effectively (Wiig, et al. 1997a; Wiig 1997b).

2.2 Innovation

Innovation is a process of turning opportunities into practical use (Tidd, Bessant et al. 1997)**.** (Dodgson, Gann et al. 2002) also defined innovation as the use of knowledge in the development and introduction of new products, processes and or services. To achieve innovation the operations and processes need to be improved so that existing knowledge is used effectively and efficiently (Nonaka, Toyama et al. 2000). Innovation can be distinguished as: 1)Technological Innovation - can be either product innovation or process innovation and; 2) Administrative innovation – can be the application of new administrative methods and systems, social or organizational innovations, financial innovations with new ways of securing and using capital, and marketing innovations with new approaches to the marketing of products and services (Holt 1983). However, organisations seeking innovation need to be aware of the need for creativity to tackle uncertainties in the innovation process (Rickards 1985; Sicotte and Langley 2000). Creative-thinking can stimulate innovation in innovative projects if well guided. For this reason it can be helpful to have workers or project managers with management skills to guide innovation.

3 Public Private Partnership/Private Finance Initiatives

Public Private Partnerships is a procurement method where the public sector (government) and private sector (commercial organisation) collaborate to deliver a service. Throughout the 1980s, the PPP had been viewed as a derivative of the privatisation movement, which fascinated conservative leaders in western, liberal regimes especially in the United Kingdom and United States of America (Linder 1999). The UK concept of Public Private Partnerships has extended widely since the late 1990s, to include complete or partial privatisations and joint ventures, as well as contracting out of public services with private financing (Spackman 2002).

The Canadian Council of Public Private Partnerships defined Public Private Partnerships as: **'***A co-operative venture between the public and private sectors, built on the expertise of each partner, that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards'* (Partnerships 2008). The benefits of PPP delivery is the acceleration of predevelopment and construction activities and thereby reduce the interest cost during construction, which results in significant cost savings. The long-term capital at risk and accompanying operation and maintenance costs and the risk associated with the cost of capital ties the contractor into commitment (Spackman 2002; Stainback and Donahue 2005) .

However, contractual agreements is an effective means of mitigating any problems envisaged that may arise but developing trust, cooperation and a strong commitment towards the implementation of the project can be the main drivers of a successful project. PPP concession agreements provide are mostly for a long duration and this is an advantage to develop trust between partners.

Public Private Partnerships are often used interchangeably with Private Finance Initiatives which can cause confusion. PFI is a procurement tool and Public Private Partnerships is an ownership structure where the Government owns an equity stake in a

company, an asset, and this is therefore different in kind from a PFI transaction (Treasury 2003). Private Finance Initiatives are arrangements where the public sector contractors purchase quality services on a long-term basis so as to take advantage of private sector management skills incentives by having private finance at risk. This includes concessions and franchises, where a private sector partner takes on the responsibility for providing a public service, including maintaining, enhancing or constructing the necessary infrastructure (Treasury 2000). It is been argued that PPP/PFI has had the effect of raising the costs of infrastructure development in the health service. The assumption that higher capital costs would be offset by savings resulting from the involvement of the private sector has been proved to be incorrect (Gaffney and Pollock 1999) and the claim of innovation have not been identified (Eaton, et al. 2006). Section 6:0 of this paper will identify the obstacles to innovation in PPP/PFI projects.

4 Overview of Knowledge Transfer and Innovation Processes

Organizations that do not adopt knowledge management can expect to be absorbed by more successful companies (Wiig, et al. 1997a; Wiig 1997b). Organizations need to know what to learn and share to execute a business strategy and these calls for the adoption of knowledge processes for linking the whole segments of the organization to effectively manage their knowledge to achieve expected return.

Different studies have developed frameworks and models on how to manage and use knowledge such as: Majchrzak, et al. (2004) suggest how their process framework for knowledge reuse for innovation can be used to describe early stages of problem definition, search activities and to develop the idea before usage; (Carlile 2004) describe how to generate innovation when knowledge must be shared and assessed by actors across different domains; (Zack 1999a) suggest a knowledge strategy on how knowledge gap in organizations can be address through evaluation of their knowledge resources and capabilities to address the gap; (Szulanski 2000) describe how through the stages of knowledge initiation, implementation, ramp-up and integration an organization can achieve satisfactory performance of knowledge.

While there are various research on how to manage knowledge there is another area of knowledge management concerned with cross-border or movement of knowledge across boundaries (Kostova 1999; Carlile and Rebentisch 2003). The movement of knowledge is the process of knowledge transfer through information processing and sharing common knowledge (Carlile 2004). Different studies have developed frameworks or models for knowledge transfer. Argote and Ingram (2000) describe how moving knowledge reservoir and subnetworks can be effective to transfer knowledge by adapting knowledge to new contexts. However, the source of knowledge must be compatible with or fit the new context where it is needed. The issues of organizational work processes, practice and patterns have to fit the new context to achieve the purpose of the knowledge. Cohen and Levinthal (1990) in their model argue that the prior related knowledge and diversity of expertise in an organization are factors needed to exploit knowledge and enable knowledge transfer. However, users of new knowledge can be educated prior to implementation to increase their understanding and awareness which can be through the source of knowledge to enable knowledge transfer**.** The

urgency at which it is required can be one of the factors to consider due to the duration it will take to implement.

Trott, et al. (1995) in their model identified awareness; association; assimilation and application as major components for knowledge transfer but then requires the effective management of the range of behaviour in the organization to enable assimilation and application of knowledge to meet ends. Major and Cordey-Hayes (2000) argue that Trott *et al*, (1995) model of knowledge transfer is incomplete because there is no section for knowledge translation which would have provided the opportunity for understanding the knowledge before assimilation, however, in their combined conceptual framework knowledge moves through data collection; collation; translation; assimilation and commitment which they argue will successfully transfer knowledge. However, knowledge transfer in organisation can occur through other mechanisms such as observation ((Nonaka 1991); knowledge replication (Szulanski 2000); and communication (Levine, Higgins et al. 2000). Knowledge is acknowledged from the literature as important for the survival of organizations in competition but there is no one mechanism agreed that is must effective for knowledge transfer.

Knowledge plays an important role in innovation process and knowledge and innovation are the competitive strength needed for success in companies (Nonaka 1991; Nonaka and Takeuchi 1995; Sveiby 1997; Johannessen, Olsen et al. 1999). The process of innovation begins with searching and selection of knowledge; exploration and synthesis of knowledge; divergent thinking for different perspective and acceptable action but all need to be coordinated and focused (Leonard and Sensiper 1998) to achieve the intention of the innovation. Rickards (1985) suggest a process at project level on how to stimulate innovation through: 1) systems consideration - for the adoption of the innovation, selection and integration of the innovating team, structure of the innovating system and deciding on stages of the innovation; 2) diagnostic aids - to discover the aspect of an organization or environment to become aware of new possibilities such as subjective views of employees of their environment, identify individual and group behaviours through tests and the business environment; 3) search techniques – searching, or opening up possibilities, and selecting, or closing down possibilities; 4) decision aids – using decision aids such a clustering, hurdles, weighting systems and gut feel to close down or decide; and 5) routinising the innovation process.

Rogers (2003) describe five innovation-decision process that individuals or organizations pass, from awareness of a need to routinising the innovation. This process is: 1) knowledge – awareness of an innovation and gaining understanding; 2) persuasion – when forms of favourable or unfavourable attitude toward innovation are formed by individuals; 3) decision - when the individual or organization engages in activities that lead to a choice to adopt or reject the innovation; 4) implementation – when the innovation is put into use; and 5) confirmation – is a situation when the individual or organization seeks to confirm already made decision**.** Roger's innovation process is about the initiation and adoption of innovation which emphasised innovation goes through stages but other researchers such as (Damanpour and Evans 1984) view innovation as a product that can be defined to know the previous circumstance or experience and consequences of innovation within an adopting unit in an organization.

Gopalakrishnan and Damanpour (1994) argue that in reality no innovation process can be neat, orderly and sequential but instead follows a messy and multiple sequences.

5 Knowledge Management/Knowledge Transfer in the Construction Industry

The skill to transfer knowledge can be helpful to avoid "rewinding the wheel"; to create new knowledge and to exploit knowledge. In addition, the transfer of knowledge between projects can assist to resolve the problems associated with PFI procurement such as; costs involved in bids; the inequality in experience between client and contractor; long contract negotiation period and the inadequacy of client briefs (Robinson, Carrillo et al. 2004). The short-term working contracts; the functional fragmentation of project activities and; the temporary coalitions of project team are factors that hinder knowledge management and innovation (Rosenfield 1990; Rosenfeld 1994; Slaughter 1998; Gann 2000; Dubois and Gadde 2002; Kumaraswamy, et al. 2004; Eaton, et al. 2006). Furthermore the adversarial relationships that assist in most construction projects encourages concealing of information and knowledge and this can be a major barrier to learning (Barlow, Ohen et al. 1997).

Egbu and Botterill (2002) in a study explore the role of Information Technologies in the construction industry for knowledge management and found that organizations use more of the conventional techniques such as face-to-face interaction and intranet/internet for acquiring, developing and applying knowledge while the sophisticated information technologies, such as Groupware and Knowledge Maps are not as would implemented. Wetherill, et al. (2002) developed the e-COGNOS project, which aims at specifying and developing an open model-based infrastructure to enable consistent knowledge management within collaborative working environments such as the creation, capture, indexing, retrieval and dissemination of knowledge. The e-COGNOS goes through a cyclic or iterative approach.

Al-Ghassani, et al. (2002) developed a framework called CLEVER (Cross-sectoral Learning in the Virtual Enterprise) to aid organizations in establishing a knowledge management strategy. The structure of the framework has four main stages with aims and outcomes to address and select appropriate knowledge management strategy. The outcomes expected at each stage of the framework help to guide participants or users to achieve intended objectives of the organization. Also a benefit that can be derived from CLEVER is that it helps identify the knowledge management problem faced and how it can be resolved.

Carrillo, et al. (2006) developed a knowledge transfer framework in the context of PFI project to enable organizations manage project knowledge. The framework includes three main stages that include: first, to identify issues in PFI process that need addressing as well as exploring opportunities; secondly, to identify knowledge to be transferred based on, its characteristics, transfer mechanism and barriers; and finally, to develop an action plan to guide the knowledge transfer. The framework provides the opportunity to identify problems associated with managing project knowledge and how best to manage and transfer same for future use.

Furthermore, different studies have highlighted the need for the construction industry to move towards building long term alliances to encourage learning, knowledge transfer and innovation. (Latham 1994) suggest the need for the construction industry to engage in partnering alliances to increase inter-firm cooperation to reduce cost and time of project delivery. Ingirige and Sexton (2006) argue that long-term collaboration alliance can sustain knowledge sharing, learning, continuous flow of resources within project teams if the "project-based mindset" relationships of short-term alliance is focused towards long-term for sustainable competitive advantage. However, lack of trust; clash of organizational cultures; lack of experience and to ensure the plans fits into the business strategy of the organization are critical factors for successful collaboration in the construction (Akintoye and Main 2007)

Information, knowledge, competence and organisational business strategy are critical aspects for the adoption of a knowledge management system. Information is needed for the creation of knowledge but the structure of the organization and the behavioural culture of the organization are aspects that can enable knowledge acquisition, creation and knowledge sharing. Competence in terms of experienced organisation personnel to implement knowledge acquired to achieve expected returns is an aspect that can determine how best an organisation can manage knowledge for future use. The business strategy of the organization can be a guide to determine the information, knowledge and competence required to achieve desired performance.

6 Obstacles to Innovation in the Construction Industry

Different studies have highlighted the importance of innovation in construction (Latham 1994; Egan 1998; Slaughter 1998; Winch 1998; Gann 2000; Vakola and Rezqui 2000; Dubois and Gadde 2002; Ling 2003; Egbu 2004; Kumaraswamy, et al. 2004; Dulaimi, et al. 2005; Eaton, et al. 2006).

Innovation is required because of pressure to improve quality, reduce cost and speed-up construction processes (Gann 2000) but the scale of the facility, complexity of the facilities, and durability of the facilities, together with the organizational and socio-political contexts affects the use of innovations in construction (Slaughter 1998). The project-based arrangement in the construction industry which is highly fragmented and focused on short-term productivity (Dubois and Gadde 2002; Craig and Sommerville 2006) can be an impediment to innovation. The high participation cost and time especially for PPP/PFI procurement (Bing, et al. 2005b) can result in organizations not investing in innovative approaches for project delivery. In addition, the separated risks allocation/management frameworks in the construction industry discourage innovations in design and construction (Kumaraswamy, et al. 2004) but cooperation between the projects team can stimulate innovation if well guided. Furthermore the lack of co-ordination among multi-disciplinary project team can hinder innovation but if efforts are taken to build relationships that are cordial this may result in approaches that are innovative to achieve successful project delivery. Dulaimi, et al (2002) found that effective coordination within a project team can assist to achieve innovation.

However, there are some positive outcomes reported on how innovation can be influenced in the construction industry. PPP/PFI is part of the construction industry and

as such the PPP/PFI arrangement could be used in any part of the construction industry (Eaton, et al. 2006) for this reason the obstacles and factors that can influence innovation and knowledge transfer in the construction industry can be applicable to PPP/PFI projects. Kumaraswamy, et al. (2004) suggest transactional efficient relational contracting that can enable collaboration throughout the project environment enabling the development of inter-organizational learning that span from project definition to project completion/maintenance. Learning is one critical factor that needs to be encouraged in the construction industry to enable innovation and this can be embedded in the working processes of the project organizations to improve project performance. Knowledge gained or salient outcomes can be transferred to subsequent projects. Working in a collaborative knowledge network can be a good approach to encourage learning in the construction industry.

Sharing of ideas in the construction industry; risk taking and management; clear goals and good communication; access to appropriate information and creativity can be stimulants to encourage innovation in PFI projects (Eaton, et al. 2006). Furthermore, (Dixon, et al. 2005) argue that the success of PFI is dependent on retaining and recycling expertise. However, this can be dependent on the construction industry to actively participate in knowledge activities with external research bodies or external knowledge sources to deliver innovative products through knowledge management initiatives (Maqsood, et al. 2007).

There is no single process or organizational structure for the facilitation of innovation, but the use of intra- and inter-organizational networks and relationships and the use of units with creativity and an avoidance of overly rigid hierarchies (King and Anderson 2002) can be of assistance to facilitate innovation. We suggest that the linking of information, knowledge and competence; efficient intra and inter-organisational networks and social relationships in projects can stimulate innovativeness and knowledge transfer.

7 Conclusion

The paper identifies the main obstacles to innovation and knowledge transfer in the construction industry as follows: 1) the pattern of couplings in traditional procurement seems to favour short-term contractual relationship which hampers innovation and learning; 2) lack of coordination among multi-disciplinary project team; 3) socio-political reasons; and 4) financial constraints. In addition, the positive outcomes on how innovation can be influenced are through relational contracting; risk taking; access to appropriate information and creativity while knowledge can be best transferred in the highly fragmented construction industry through effective coordination of the project.

However, there can be significant factors to act as drivers to enable knowledge transfer and innovation in the construction industry such as: 1) the managerial commitment of the project organizations to always look for innovative ways of working beyond one-off projects by going into partnerships with other project organizations into other areas that can improve their skill. This is imperative in improving organizational competence on different aspects of their operation in the industry. The cordial interaction can be a step towards building trust and effective communication among project team to enable

knowledge sharing; 2) the financial, human and technical resources available to an organization can be basis to explore areas that can improve their competitive advantage and to encourage innovation. Although working in collaboration with other project organizations can be helpful where the required expertise is not available within the organization; 3) information is vital for innovation to take place for this reason efforts should be taken to encourage in-flow of innovative ideas into the organization. The establishment of contacts with external bodies such as research centres or universities can be advantageous to keep of informed of new innovative ideas.

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A Review of Literature on Knowledge Management Strategy - Lessons Learned for the Construction Industry and Research

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Abstract:
In business management, the management of knowledge has been touted as the way forward in ensuring the survival and resilience of organisations. But differing opinions abound as to how its strategies could be successfully managed. Despite the increase in adoption of knowledge management concepts in other industrial sectors, the construction industry has, arguably, been slow to adopt effective knowledge management practices and strategies, and exploiting the potential benefits of knowledge management concepts and initiatives. This paper reviews available literature on knowledge management practices and strategies in other sectors and attempts to reconcile these strategies with what pertains in the construction industry. The paper also discusses the importance of knowledge management to organisational survival and competitiveness. It proffers some suggestions as to the factors that are worthy of consideration for knowledge management strategies that could be of benefit to construction organisations. It concludes by drawing our attention to the complexities of factors impacted upon the success of knowledge management strategies and initiatives. It also argues that these complexities raise interesting challenges for organisations and for research strategies and designs used in examining knowledge management strategies and practices in construction organisations.

Keywords:
Knowledge Management, Organisational Strategy, Construction Organisations

1 Introduction

In business management, the management of knowledge has been touted as the way forward in ensuring the survival and resilience of organisations. In recent year, Construction Industry (CI) is confronted with more and more intense competition. In the midst of the expedited integration of the global economy, the competition is no longer the domestic market competition, but the global – scope international competition, so the pressure is greater than ever before. In order to stay competitive, construction organisations must still be innovative in reducing their costs and expanding their markets.

Knowledge has become the most important resource and key element of modern enterprise (Nonaka and Takeuchi, 1995). Knowledge is being recognised as a strategic resource and critical source of competitive advantage in today's dynamic and changing business environment (Gunasekaran & Ngai, 2007). The need for organisations to change continuously, innovate and confront new circumstances and become learning organisations is increasingly being recognised. The aim of Knowledge Management (KM) is to facilitate learning and the creation of new knowledge by teaching individuals where to find appropriate organisational knowledge, how to use and apply it effectively and to share and disseminate it appropriately (Mason & Pauleen, 2003). Organisational and individual knowledge is vital for business entrepreneurship and for managing change (Egbu 2000). Organisations that manage knowledge can evaluate core processes, capture insights about what they find, combine their skills and experiences, innovation and apply new ideas quickly (Egbu 2000).

The foregoing is also true for the construction industry. In the construction industry, KM is vital for efficiency in project delivery and improving organisational competitiveness (Egbu 2000). Effective management of knowledge in the construction industry is likely to produce innovation, reduce project time, and improve quality and customer satisfaction (Kamara et al. 2002). Through the process of KM, the exploitation of an organisation's intangible assets creates value and knowledge both internally and industry wide.

Failure to capture and transfer project knowledge lead to an increased risk of reinventing the wheel, wasted activity, and impaired project performance. These potential benefits of KM are, arguably, convincing enough for the construction organisations to venture into adopting its principles. However, differing opinions abound as to how KM strategies could be successfully managed. Despite the increase in adoption of KM concepts in other industrial sectors, the construction industry has, arguably, been slow to adopting effective KM practices and strategies, and exploiting the potential benefits of KM concepts and initiatives. For many construction organisation's, this perception has yet to take hold.

This paper provides a review of literature on KM practices and strategies from other industries and their potential benefits to the construction industry along with the complexities of factors that impact on the success and the associated challenges.

2 Literature Review

2.1 Knowledge Management

There are many definitions about KM. KM can be defined as a:

" the conscious strategy of getting the right knowledge to the right people at the right time and helping people to share and put information into action in ways that strive to improve organisational performance" (O'Dell and Jackson, 1998, p.4) .

The benefits and importance of knowledge and KM in terms of organisation are currently being widely acknowledged. Davernport and Volpel (2001) state that:

“It is already clear that KM is quickly moving into other industries, including financial services, manufacturing, even government and military organisations. In the future, we expect that every industry will view itself as knowledge- intensive and will adopt KM approaches in virtually every business unit and function”.

According to Sunassee and Sewry (2002), the implementation of an organisation’s KM strategy is only likely to contribute to the achievement of organisational goals and outcomes of it aligned to the overarching business strategy of the organisation. KM requires understanding, firstly, the organisation strategy under which knowledge will be developed and exploited; secondly, the content and kind of knowledge; thirdly, the organisational context and finally, technical context that supports the architecture of knowledge in the organisation (Martin & Casadesus, 1999). The major competitive advantage for an organisation lies in the organisation’s knowledge assets and therefore KM has become a critical issue .To understand what KM is, it is important to have a working understanding of the differences between data, information and knowledge.

Data is generally identified as a set of discrete facts about events (Davernport and Prusak, 1998). Most organisations capture significant amounts of data in highly structured databases. The core value activity around business data is the ability to analyse, synthesis, and then transform the data into the information and knowledge.

Information is the outcome of capturing and providing context to experiences and ideas. The core value building activity around information is managing the content in a way that makes it easy to find, reuse and learn from experiences so that mistakes are not repeated and work is not duplicated.

An understanding of knowledge is a foundation for effective management.

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knower’s. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms" (Davernport, 1998).

Nonaka and Takeuchi (1995) have used Polanyi’s (1967) concept of explicit knowledge and Tacit Knowledge in defining Knowledge dimensions. Explicit knowledge is easy to articulate, capture, and distribute in different formats. As for construction organisation’s, explicit knowledge is usually shown as the design drawing, design briefs document in data base, norms, the manual handbooks, the contract file of the project and construction records. All of which are easy to be stored and transmitted. On the other hand, tacit knowledge is that which involves tangible factors embedded in things like experience, values and personal beliefs (Barrett and Sexton, 1999). It is difficult to capture or share. Tacit knowledge is directly connected with ideas, values, emotions, perceptions and experience. Thus, the subjective and intuitive nature of tacit knowledge makes it difficult to be represented or transferred in a logical and systematic way. A few examples for tacit knowledge in construction industry include estimating and tendering skills, interaction with clients/customer and project team members in the construction.

But in a project, tacit knowledge gained from successful and failed projects in the past are often perceived as very important. It is difficult to be encoded. So it has to be transferred and shared. The major challenge is to convert tacit knowledge to explicit knowledge and vice versa, in a format that can easily be absorbed by construction firms (Barrett and Sexton, 1999). Since knowledge possessed by construction firms is significantly experiential and stored in people's head, tapping into this tacit knowledge by converting it to explicit knowledge is essential.

Organisational knowledge can be created through a continuous dialogue between tacit and explicit knowledge. There are four stages of organisational knowledge conversion, socialisation (tacit to tacit), combination (explicit to explicit), internalisation (explicit to tacit) and externalisation (tacit to explicit), (Nonaka and Takeuchi, 1995). Knowledge sharing will minimise the knowledge loss that will result in the event of a straight forward transfer of tacit knowledge to explicit knowledge form. It is the root of construction organisation's efficiency. The development sources of KM regards learning actualise lifelong education, innovate and strengthen the ability of construction staff. Understanding the relationship between tacit and Explicit Knowledge and its impact on the organisation leads to informed decisions on an organisation's KM approach.

2.2 Knowledge Management and the Construction Industry

In the Construction industry the importance of KM is increasingly being recognised (Carrillo et al., 2000). Within project based architecture, engineering and Construction, KM is also being recognised as a vehicle through which the industry can address its need for innovation and improve business performance (Egbu et al., 1999). KM is vital for efficient working in projects and for improving organisational competitiveness (Egbu 2001)

There is a growing awareness of the potential benefits of KM within the construction community. All organisations manage knowledge in some form. The emergence of KM as a business initiative is forcing people to think of what they are doing to better manage "What they know" (Carrillo 2004). Organizations can gain several benefits from implementing KM strategies. Tactically, they can reduce loss of intellectual capital due to people leaving the company; reduce costs by decreasing and achieving economies of scale in obtaining information from external providers; reduce redundancy of knowledge based activities, increase productivity by making knowledge available more quickly and easily and increase employee satisfaction by enabling greater personal development and empowerment.

The construction industry is a knowledge-based industry (Egbu & Robinson, 2005). It is diverse, being made up of different organisations, consultants and professionals providing a range of services for clients, customers and the wider community (Egbu & Robinson, 2005). KM has always been a challenge to the construction industry, which is predominantly a project-based industry (Kamara et. al 2000). Construction organisations have many reasons to practice sound KM initiatives. The construction industry faces several problems in managing knowledge due to its characteristic. The construction industry usually maintain some characteristics in the operation determined by their properties such as the high physical labour-intensity, the obvious function of

human factors, the low entry threshold for the staff, increased turnover of sub labour and has a short term temporary project based nature with considerable fragmentation, hence, most of the knowledge of the industry is generated in projects during the process to deliver a custom-built facility in accordance with the client's requirements and business objectives (Haichen et al, 2005). For the construction industry, KM is particularly important for the following reasons:

The capture and access to good (and bad practices) within project environments are essential to ensure better/improves project or service delivery of other projects. Since projects are in the main one-of-a-kind, there is no standard template or set of practices that is applicable to all. Though a generic set of processes and associated good practices may be considered, it is the unique processes and practices that are of value from KM perspective.

Consequently, each day on the construction site brings forth a new problem and a new solution. These problems and solution are rarely well documented and valuable lesson learned confined to the mind of only those who experienced them. The ability to manage the knowledge generated from the projects not only help prevent 'reinvention the wheel' and the repetition of the similar mistakes, but also serve the basis for innovation, overall improvement and sustaining competitive advantage (Haichen et al, 2005).

The job location for construction project often changes and the line workers are lost to other construction companies and are transferred frequently. The practical experience, tacit knowledge, is especially important to the work of construction. Similarly, the bid of the project, the management of materials and the supervision of the site are exceptially difficult to be got learn from books. The project based nature of the industry has made it particularly important to record and transfer knowledge from one project to another. Therefore, it is necessary for construction industry to accumulate the experience from construction and project management, which could be of benefit to training employee and for project cost reduction and subsequently be transformed to the knowledge assets of the organisation

Construction industry has low productivity and poor performance despite its importance in the national economy (Egbu et all, 1999).

Therefore, construction industry must adopt KM strategy to improve its management and for the purpose of survival in the intense competition. This industry, thus, is required to pay more attention to knowledge and KM than ever before, especially to tacit knowledge.

2.3 Application of Knowledge Management Strategy in the Construction Organisations

The primary objective of any corporate KM program is to support the achievement of strategic business objectives. In other words, the starting point for KM is to understand what the organisation's business objectives are. In order to be successful, KM must not be an end in itself, but must be a strong enabler to achieving real business results. This end is achieved by defining KM strategy for organisation that flows from and dovetails the business strategy. Knowledge strategies and km initiatives that are "stand-alone"

and not linked to business strategy are not likely to succeed. The key to defining and implementing a Knowledge Strategy that will lead to business results are steps such as fostering the corporate culture to encourage knowledge learning and sharing, Establishing technology platform, human resource management practice, organisational structure and leadership.

KM is an extremely complicated issue (Ruggles, 1998). It requires a profound understanding of numerous factors affecting the vicinity and environment of a construction industry. Other Industrial sectors have adopted this principle and several construction organisations have now formulated KM strategy, with the aim to continuously improve an organization's performance through the improvement and sharing of organizational knowledge throughout the organization.

A KM strategy sits at the top of any successful KM implementation. The success of any KM exercise heavily depends on the basic visioning and strategy. A strong vision helps a company keep an eye on the goal to be achieved, helping the success of KM to become more quantifiable and measurable. A visioning and strategic planning exercise enables organizations answer basic but important questions like – what do we want to achieve by implementing KM? Not many organizations have a definite answer to the strategic intent of a KM exercise, which is why they end up having a completely different system in place than the one planned for and which somehow nobody wants to use. For construction organisations, good KM practice require knowledgeable people who are supported by integrated information, data sources in order to generate informed decision-making (Sheehan et al, 2005)

One widely adopted classification of knowledge management strategies is from a study by Hansen et al. (1999) on KM practices in three service industries. They found two different KM strategies which are Personalisation and Codification strategy. The personalization strategy, focus on the tacit dimension of knowledge and assumes that knowledge is shared mainly through direct interpersonal communication. On the other hand, the codification strategy outgrows the knowledge and assembles it, and is in the form of codified explicit knowledge, coding information and storing it electronically in an organizational memory, which is convenient to employees to check.

Both strategies need IT support in terms of software and hardware at different levels. In the codification strategy, a company must use IT powerful to store big documents and with a search engine, so that it is convenient for people to check and download the document they need. But in the personalisation strategy, the most important system is where people seek help from others through it. The requirement of software and hardware is far less than the former. Some examples of knowledge management initiatives from other industries described in the mainstream literature are presented by Hansen et al. (1999).

However, before embarking on KM initiatives, the construction organisation's need to formulate appropriate KM strategy. The formulation of a KM strategy involves an examination of a number of interrelated concepts and factors (Kamara et al, 2000). In order to formulate KM strategies, Steyn & Kahn (2008) list five steps that are needed in order to be successful in managing knowledge; organisational culture, information and communication technologies (ICTs), Human resource management practices,

organisational leadership and organisational structure. Each of these five steps will be discussed in turn.

2.3.1 Fostering the Corporate Culture to Encourage Knowledge Learning and Sharing

Much creation and transfer of knowledge can be enabled by a knowledge oriented culture. Davenport and Prusak (1998) found knowledge-friendly culture to be one of the most important enabling conditions. Skyrme and Amidon (1997) stress organizational culture as an enabling necessary condition for knowledge transfer. Organizations can remove formal barriers to create a knowledge oriented culture (Skyrme and Amidon, 1997). It can then be assumed that various organizational arrangements can change the organizational culture. Instead of culture, (Hedberg, 1981) focuses on redesigning internal and external environments. He suggests a redesigned internal environment with conditions encouraging risk-taking and experimenting, which would enable learning.

Understanding the culture of the organisation is the first step that needs to be taken before implementing the initiative. The types of culture present in an organisation affect the ways in which KM is managed, and can, as a result either persuade or discourage the use of km practices. A KM strategy has to be carefully crafted if any knowledge 'silos' exist within the organization, where people don't share knowledge, resulting from fear of possibly loosing a competitive edge and hence a place in the organisation. A 'one size fits all' KM strategy should be avoided because this has produced consistent failures over time. Egbu et al. (2003) provided a list of various aspects of organisational culture that would support a KM initiative and at the same time they also recognised various aspects of a culture that may affect an organisation negatively. The culture must be geared towards rewarding innovation, learning, experimentation, scrutiny and reflection (Allee, 1997).

For creating an organisation wide culture of knowledge sharing and to institutionalise KM, it is critical for all employees to engage in km activities. In construction organisation's, employees should have a positive orientation to knowledge. That is, employees should be bright, intellectually curious, willing and free to explore and also employer should encourage their knowledge creation and use. Employees also should not be inhabited in sharing knowledge, that is, they should feel that they are not alienated or resentful of the company.

2.3.2 Establishing Technology Platform

Every organisation has a unique collection of knowledge assets and distinct business problems to which solutions must be applied. The platform composed of its infrastructure and applications must support the wide variety of need that arises. IT can provide an edge in harvesting knowledge from piles of old buried data repositories. Furthermore, Ruggles (1997) identifies the value of technology in providing KM to enhance and enable the implementation of sub-processes of km e.g. knowledge generation, codification, and transfer. This is also supported by Offsey (1997) who states that IT is clearly required to enable the organisation's km processes The rise of networking computers not only expands the range of knowledge sharing but also reduces the cost of knowledge transferring. It also has dispelled the communication hindrance caused by hierarchical and value notion when contracting face to face.

Technologies such as data mining and warehousing will help to encourage KM in modern organisations. It is important for construction organisation's to create room for experimentation, particularly with new technologies-blogs and online communities with wiki (open editing) technologies. There are many tools that could be used for KM, for construction organisation especially virtual project the uses of internet, group share system such as video conferencing, document management system, CAD systems, analysis system, estimating systems and etc will radically affect the speed and efficiency of knowledge generation and dissemination, In turns these will influence developments in working practices and social interaction. ICT helps to knit experts in each of these processes into communities and facilitates collaboration among member of these communities.

Carneiro (2000) suggests that a KM system should be developed as a response to changes in the internal and external environments. Carneiro (2000) explains that such a system is to be adapted to solve problems that negatively affect operating efficiency. However, KM is more than just the application of ICT for managing knowledge intensive application. Knowledge is predominantly a new way of thinking about modern organisation.

2.3.3 Human Resource Management Practice

A KM strategy must be firmly rooted in the human resources strategy as its success relies on being incorporated into the recruitment and selection process, staff learning and development, the performance management and rewards system, as well as being part of mobility and reassignment. Human resource strategy needs to bring people together so that they can build informal networks (Lubit, 2001)

Armstrong (2000) regards the role of human resource in KM as "to facilitate the dissemination of learning through workshop, projects and conference and later, to take responsibility for co-ordinating the preparation of business plans which incorporate the outcome of the learning activities". The main tasks of human resource management are to monitor measure and intervene in construction, embodiment, dissemination and use of knowledge by the employees (Soliman and Spooner, 2000). Therefore to succeed, a KM system ought to emphasise the management of these human relationships.

Knowledge sharing is not necessarily a natural process Thus, initially in implementing KM; it is encouraged to introduce corresponding incentive mechanism as rewards of knowledge sharing. Rewards and recognition scheme is needed in order to motivate people to share their knowledge. This can create interest, excitement and motivation among people, and ensure early adopters get high visibility so they serve as role models for others.

2.3.4 Leadership

When planning implementation of a knowledge management program, the organisation needs to consider whether to create a leadership role to develop and drive the process; For instance, a chief knowledge officer. Leadership is a crucial focus on establishing a culture that respects knowledge, reinforces its sharing, retains its people, and builds loyalty to the organization. Organisational management and leadership can also influence the outcome of KM strategy by influencing the nature of knowledge resources

present in the organisation, their deployment and their utilisation (Sunnasee and Sewry 2002). One of the most strategic leadership features is envisioning a preferred future and charting a way to get to that future. A knowledge vision provides corporate planners with a mental map of three related domains: the world they currently live in; the world they ought to live in; and the knowledge they ought to see (Von Krough et al. 2000). A knowledge vision should specify what knowledge that members need to seek and create. An era of the knowledge leader is emerging and is inevitable. It is through leadership that a successful KM initiative can be undertaken. Having a knowledge manager as a 'knowledge leader' can advance organisational KM initiatives.

2.3.5 Organisational Structure

The first important variable is leadership with a vision, strategy and ability to promote change. It is vital to have a compelling knowledge management actively promoted by the Chief Executive that clearly articulates how knowledge management contributes to achieving organizational objectives such as special team to aggressively manage knowledge property i.e., manage intellectual assets as routines-process, appropriate technology, infrastructure for ''social'' and electronic networking to allow for innovation and leverage organizational knowledge. According to Pinchot and Pinchot (1996), in order for knowledge to be utilised effectively in the knowledge economy, organisations will have to make a number of fundamental shifts in terms of organisational structure. These shifts includes a move from individual work to team work, from functional work to project based work, from single skilled personnel to multi skills employees and from coordination from above to coordination among peers.

2.4 Challenges in Implementing KM

Despite the popularity of the view that KM is a core component of competitiveness, KM remains a major challenge to construction industry. There are number of reasons why developing a smooth and effective KMS represents a considerable challenge. Most of the barriers to effective KM involve people. Human are complex with diverse psychological needs. Survey by Carrillo et al. (2004) ranked the main challenges faced in implementing knowledge management in construction organisations as:

1. Not enough time
2. Organizational culture
3. Lack of standard work processes and
4. Insufficient funding.

People are already busy, and sharing knowledge may mean changing the way they work or adding extra steps to the process of data and enter it into a repository. It is essential to create time and opportunities for people to learn. One successful approach is to create formal learning networks so that the identification and transfer of effective practices become part of the job. The greatest enemies of knowledge sharing are the time that is required to input and access information and the lack of motivation among potential users (Mayo, 1998).

Many writers have identified culture as a significant barrier to sharing knowledge (Carrillo et al., 2004). An inconsistent or non existent culture of sharing may exist in many facets of an organisation leading to poor knowledge transfer and workplace

openness and trust. In some instances, team members may be reluctant to share knowledge if they fear criticism from their peers, or recrimination from management. They may also be subversion of group efforts if there is a lack of respect, trust and goals. Reward systems are sometimes based on what personal background knowledge and individual effort, and may be a source of advancement within an organisation. One way to overcome this is to reward information sharing, but this can be difficult to measure. Once a reward system has been instituted, the quantity if knowledge share is likely to increase, but the quality may decrease (Scheraga, 1998).

At individual levels, people are often reluctant to share information. Professional knowledge is perceived as a source of power. There is sense of worth and status gained because of expertise. People tend to have felling "ownership" and hoard knowledge. There can also be feared that there will be a diminished personal value after giving up know-how (Hibbard & Carrillo, 1998).

According to Carrillo et al., (2004), lack of standard work processes is a problem with large organizations where, in some cases, they have grown rapidly and there are no longer standard procedures leading to different approaches being adopted. The low profit margins of construction organizations and their conservative nature have also led to reluctance to invest in KM initiatives and the infrastructure support required.

3 Research Methodology

This paper is based on a thorough review of extent literature. In the main, literature is drawn from different tradition and industrial sector. It draws on areas of knowledge management, innovation, competitiveness, organisational dynamic, organisational structural and culture. The articles reviewed for this paper have been gathered from journals, conference proceedings, books, monographs and web site.

4 Conclusion and Further Research

Developing a KM practice requires a well-balanced approach. KM is not an ultimate tool that solves all information and knowledge creation and transfer problems. However, by utilising KM, better performance can be achieved by interaction between individuals or groups. Consequently, even though KM is one of the most promising issues of the newly emerging knowledge era, it requires phenomenal change of understanding. If the construction industry intends to survive in the global competition, they have to give more emphasis to KM Strategy. Construction industry needs to begin to analyse their organisational knowledge. As a strategic asset, it is the key to competitive viability and growth of the learning organisation. The culture of the organisation is also critical element in determining the success or failure of any KM program. The new practice, thus, may improve business performance more explicitly and provide valuable insight on how knowledge may be strategically managed.

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Knowledge sharing in quantity surveying firms in Malaysia- How the literature review informs the research approach

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Abstract:
Knowledge sharing in organisation is the act of making knowledge available to others within the organisation. It is the process by which knowledge held by an individual is converted into a medium that can be understood, absorbed, and used by other individuals. Knowledge sharing is important as it provides a link between the individual and the organisation by 'moving' knowledge that resides within individuals to the organisational level, where it is converted into economic and competitive value for the organisation. This degree of importance attached to knowledge sharing is heightened in a knowledge economy, where knowledge is seen as a valuable resource for innovation and for gaining competitive advantage. However, increasing evidence points to a paucity of research that has investigated the nature of the different approaches to improving the effectiveness of knowledge sharing, and the appropriate organisational factors at play for knowledge sharing to be fully exploited, and its benefits derived within Quantity Surveying(QS) firms in Malaysia. Therefore, this paper purports to provide an insight, based on a review of literature, into knowledge sharing between individuals in QS firms. It also highlights the main factors that could be seen to inhibit the implementation of knowledge sharing initiatives within QS firms and how the organisation is placed to address the challenges. This raises interesting discussions to do with how best to research knowledge sharing issues in organisations, which is an important aspect of a study on Knowledge sharing in QS firms in Malaysia. Some of these issues are raised and discussed in the paper.

Keywords:
Knowledge Sharing, Organisational Culture and Structure, Quantity Surveying Firms

1 Introduction

Knowledge is the most important strategic resource in the organisations (Drucker, 1993). Knowledge has to be managed in ways to make sure the implementation and sharing of the knowledge is accomplished. Another important issue is the usage of knowledge, which ideally, must be captured, shared and used. Methods on how to capture valuable knowledge will depend on the type of knowledge, tacit or explicit. Knowledge exists at multiple levels within organisations. De Long and Fahey (2000)

divided this into individual, group, and organisational levels. Roos and von Krogh (1992) added the levels of departments and divisions. People are very important in organisation to leverage its knowledge because it is people, who actually can create, share, and use the knowledge. Leveraging knowledge is only possible when people can share the knowledge they have and build on the knowledge of others. Knowledge sharing is the act of making knowledge available to others within the organisation.

Knowledge sharing provides a link between the individual and the organisation by moving knowledge that resides with individuals to the organisational level, where it is converted into economic and competitive value for the organisation(Hendriks, 1999). Davenport (1997) defined sharing as a voluntary act and distinguished it from reporting. Reporting involves the exchange of information based on some routines or structured formats whilst sharing implies a conscious act by an individual who participates in the knowledge exchange even though there is no compulsion to do so.

QS services are becoming more complex and complicated. To be more competitive QS firms must enhance their skills and store them in a manner to speed up the work. Ways and means are proposed to prepare our professionals to meet the challenges ahead and to pave the way forward (Lim, et. al. 2006). In practice, the lack of knowledge sharing has proved to be a major barrier to the effective management of knowledge in organizations (Davenport & Prusak, 1998). Based on this reason, knowledge sharing is viewed as a main driver for the QS firms to be competitive. A survey of United Kingdom engineering and construction firms revealed that one of the main drivers for knowledge management in construction is to share valuable tacit knowledge (Robinson et. al., 2001).

Currently, there are only 278 Registered QS firms in Malaysia (Board of Quantity Surveyors Malaysia). On the other hand, Malaysia's high level of economic growth and the aspiration of becoming a developed and industrialized nation has created the environment for growth and stimulated changes in construction industry (Abdullah et. al.,2004). As such, the Malaysian QS firms have been selected in this study as this is the right time to discover the implementation of knowledge sharing in QS firms. It is hoped that the aim of the research to improve the implementation of knowledge sharing in the organization will be achieved.

2 Knowledge Sharing Between Individuals

Hendriks revealed that knowledge sharing implies a relationship between at least two parties - one that possesses the knowledge and the other that acquires the knowledge while (Cohen and Levinthal, 1990) proposed that interactions between individuals who possess diverse and different knowledge enhance the organisation’s ability to innovate far beyond what any one individual can achieve. Knowledge sharing also leads to the dissemination of innovative ideas and is considered critical to creativity and subsequent innovation in organisations (Armbrecht et.al. , 2001).

Knowledge sharing between individuals is a process that contributes to both individual and organisational learning (Andrews and Delahaye, 2000). Organisational knowledge is recognised as a key component of organisational learning (Dodgson, 1993). Huber

(1991) identified four knowledge concepts that contribute to organisational learning as knowledge acquisition, information distribution, information interpretation, and organisational memory. The voluntary act of sharing knowledge by an individual contributes to knowledge distribution, and the process of sharing may result in knowledge acquisition by other individuals within the organisation. Knowledge sharing between individuals thus results in individual learning, which in turn may contribute to organisational learning. A possible concern in this approach to managing knowledge is that much of organisational knowledge is controlled at the level of individuals (Staples and Jarvenpaa, 2001). Lam (2000) mentioned that individuals use the knowledge they have in their daily activities at work and organisations should facilitate the sharing of this knowledge with others. Weiss (1999) emphasised if individuals stay with the organisation, the full extent of their knowledge may not be realised and utilised unless there are opportunities for the individual to share that knowledge with others in the organisation.

2.1 The Individual Knowledge

Lam (2000) defined individual knowledge as “that part of an organisation’s knowledge which resides in the brains and bodily skills of the individual”. It involves all the knowledge possessed by the individual that can be applied independently to specific types of tasks and problems. Lam (2000) also added that individuals have cognitive limits in terms of storing and processing information. Individual knowledge tends to be specialised and domain specific in nature. Polanyi (1958) also emphasised that tacit knowledge can be generally understood as the form of knowledge that exists within an individual, and is intuitive and unarticulated. Tacit knowledge has been conceptualised by a myriad of academics from differing perspectives. According to (Collins, 1995) there are three types of tacit knowledge that present challenges to epistemological concerns of management. Firstly, embodied knowledge describes a type of knowledge that is a function of the physical environment. It cannot be easily transferred from one brain to another. Secondly, embrained knowledge describes a type of knowledge that is specified by the exclusive physicality of an individual brain. Finally, encultured knowledge describes a type of knowledge that is embedded within a social context and cannot exist apart from it. Nonaka and Takeuchi (1995) argued that organisations cannot create knowledge without individuals, and unless individual knowledge is shared with other individuals and groups, the knowledge is likely to have limited impact on organisational effectiveness. Thus, knowledge is created through interaction between individuals at various levels in the organisation. Argote (1999) noted that the incomplete transfer of knowledge would incur a 'so-called' knowledge depreciation or organisational forgetting and also added that knowledge depreciation, like the concept of currency depreciation, can be defined as knowledge losing its value. It usually occurs when employees quit a job without the transfer of their knowledge; Existing organisational knowledge is obsolete (because the company temporarily loses its competitiveness); New creative products and services are rendered sub-standard by old know-how or unprofitable products; Knowledge is incompletely transferred (or selective individual knowledge is shared and/or the sharing practices are only for some certain individuals); Organisational knowledge is difficult to access.

This has negative impact on organisational performance such as the decreased level of productivity, the decay of customer satisfaction, unmet delivery commitment,

inappropriate managerial decision-making and mistaken strategic behaviour (Argote, 1999). This in turn would lead to reduced organisational effectiveness and competitiveness.

2.2 Roles of Quantity Surveyor and Knowledge Sharing

According to Willis and Ashworth (1987), the Quantity Surveyor (QS) is the person who has major skills in: Economic -Associated with the assessment of value for money and cost effectiveness in design. Relying upon analysis and evaluative techniques necessary for costing, measuring and valuing in order that clients may be advised correctly; Legal-Based upon a general knowledge of law and specialist knowledge and interpretation o the law of contract. This is used in producing contract documentation and in the advice and settlement of contractual matters, disputes and claims; Technological-A knowledge of the construction process and the methods used in the construction of buildings and other structures, together with an in-depth knowledge of the industry. This provides a basis for developing other skills ;Managerial- The ability to organise the work associated with the construction project and to influence others in the procurement of buildings and structures, together with skills of an administrative function. According to Abdullah and Haron, (2007) there are many roles for the QS to apply their knowledge in the QS firm, either in their basic roles or additional roles. The greatest challenges for the QS in carrying out their roles from the knowledge sharing points of view are:

2.2.1) Preparation of preliminary estimate and cost plan 2.2.2) Preparation of Bills of Quantities/ tender documents. 2.2.3) Valuation of works for interim valuations/ certificates and 2.2.4) preparation of final accounts. 2.2.5) Cost analysis/ planning 2.2.6) Contractual advice. 2.2.7) Additional services provided like project management, value management and facilities Management.

2.2.1 Preparation of Preliminary Estimate and Cost Plan

One of the early duties on any construction project is to suggest to the client possible preliminary estimate and cost plan. Where this is acceptable to the client or where a figure can be agreed upon, an approximate estimate for the project is prepared using one of the methods. The methods may be unit methods, superficial methods or approximate quantities or cost planning. The best records for use in any form of approximate estimating are those derived from the surveyor's previous project and past experience (Willis and Ashworth, 1987). It is difficult when the surveyors have no previous record as a reference.

A frequent question arises, "where to get this useful guide when the firm has no document for reference?" This information could be gained from the internal person or from an outsider (professional colleague or from another QS firm) for this information. This raised further questions - Is it sensitive or not to give the information to do estimation? What are the challenges contributing to this problem? What is the mode of knowledge sharing they are using? How about the size and structure of the quantity surveying firm affected sharing knowledge? Is it the small size of the firm can easy for accessing the information? Is it the large firm difficult for the surveyor to meet each other to share knowledge?

In these circumstances the schedule of rates developed by Public Works Department Malaysia or technical press such building magazine may need to be consulted. This type of information however be treated with great caution since it can produce misleading results. It can rarely be used without some form of adjustment.

The challenges are when to get the information from the external sources whether from the quantity surveying's firms or from other sources. This is very sensitive issue. The external sources do not give the information about the price if no trust exists between them. Trust is very important. According to Ghoshal and Bartlett (1994), trust is one of four primary dimensions in organisations influencing the actions of individuals. Huemer et al.,(1998) further argued that even though the distribution of power matters in organisations, trust is more important as trust facilitates learning, and decisions to exchange knowledge under certain conditions are based on trust.

Knowledge sharing between the surveyors could occur between e-mails, mobile phones, story telling, telephones, faxes and pagers. According to Egbu and Botterill, (2002) telephones, mobile phones, pagers, faxes, story telling, quality circles, mentoring and shadowing, coaching and job rotation are considered to be effective in sharing tacit knowledge. Bulletin boards, portals, wireless devices, e-mails, intranets, extranets and web sites all help to improve communications between people and can assist in information management (Egbu et. al., 2005).

An organisation size also related to the employee's perception on knowledge sharing culture. Employees in smaller organisation will rely and interact to each other socially (Connelly and Kelloway , 2003).

2.2.2 Preparation of Bills of Quantities (BQ) / Tender Documents.

The main purpose of the Bills of Quantities (BQ) is for tendering. BQ may not be appropriate for all types of construction work, and other suitable methods of contract procurement are available. For example, in the case of minor works, a drawing and specification may be adequate, or where the extent of the work is unknown, payment may be made by using one of the methods of cost reimbursement.The drawings may be sent with a complete specification to the quantity surveyor or he may be asked to go to the architect's office to collect them and discuss the job.

The challenges when doing this job are when the drawing, specification and schedules for finishes (if any) are not complete/ have errors. Any verbal instructions are not writing in notes. Further drawings have to be informed and agreed by both the architect and the surveyor. The queries may be listed and must be agreed by the architect. Another challenge is to execute measurements using IT; an example is undertaking measurements using 'Masterbill' software. It is very difficult for the QS to do measurement if he/she has no knowledge about this software.

Standard Methods of Measurement (SMM 2) is referred when the taker off doing his job. This standard measurement is endorsed by Board of Surveyors Malaysia. The challenge here is to interpret every clause according to his work in the SMM2. The QS must have enough knowledge to get through this job. Sharing the tacit knowledge is about to share how to taking off fast. The capability to taking off by different person is

not the same. Organisational structure that is less bureaucratic better support knowledge flows (Serenko et.al. 2007)

2.2.3 Valuation of Works for Interim Valuations/ Certificates

To prepare the interim valuations/certificates the QS has to value, on each occasion the amount of work which has been done since the beginning of the contract and the value of unfixed materials and goods on the site on the valuation date. From the total value so arrived at, the total of previous payments on account, if any, will be deducted, leaving a balance due for payment. Any under valuation or over valuation of either work completed or of unfixed materials on the last previous valuation date will be automatically corrected. Both of them have to agree certain point before the valuation has been issued.

The challenge is the QS on behalf of the client have to go to the site and do the valuation and he has to discuss with the QS on behalf of the contractor. If both of the QSs are not satisfied about the valuation, so they have to discuss to make solution.

Knowledge sharing happens between the QS and other people such as consultants, project manager, contractor and among project partners. Knowledge sharing between QS on behalf of the client and the QS on behalf of the contractor is very important. The valuation for certificates should be made as accurately as is reasonably possible.

2.2.4 Preparation of Final Accounts

When the final account has been agreed, a photocopy of the original document (or, if sufficient, just the summary pages) will be sent to the architect or the quantity surveyor (if appropriate) with a notification of the balance due to the contractor in settlement, after deduction of the total amount of interim certificates. It may necessary to prepare a separate statement to show the reduced sum due, if the quantity surveyor has made payments when the contractor has defaulted. Upon notification of the sum due, the surveyor is required to issue the final certificate within two months after the happening of the last events.

According to Ramus and Birchall (1996) the final account must state: 1) the adjusted contract sum adjusted/ascertained final sum (i.e. the total of final account); 2) the total amounts paid on account; 3) the difference between the two amounts expressed as a balance due from one party to the other. Such balance is stated to be `subject to any deductions authorised by the conditions', such as those instanced in the preceding paragraph. The challenge - there will often be disagreements between the different parties in the project.

Knowledge sharing between the quantity surveyors and the colleagues in the firms, with the architect/project manager/consultants, with the contractor’s QS, the clerk of work and also with the contractor. They are using telephones, emails, mobile phones, pagers, faxes, story telling, quality circles, mentoring and shadowing, coaching and job rotation.

2.2.5 Cost Analysis / Planning

Cost planning seeks as a controlling mechanism during the design stage. It aims in providing cost advice to control expenditure and also to offer the client better value for money.Cost planning process commences with the preparation of an approximate estimate, and then the setting of cost targets which are generally based upon elements. As design evolves these cost targets are checked for any under or over spending against the architect's details. The prudent QS will always be looking for ways of simplifying the details, without altering the design, in an attempt to reduce the tender sum. The surveyor will consider not only the building construction but also the ease or otherwise with which the design can actually be built. If the process is carried out satisfactorily it should at least result in fewer abortive designs but should not be thought to cease at tender stage but to continue throughout the post contract control procedure.

The challenge happen when the expenses are exceeded the limit of contract sum. Here the surveyor will be expected to be able to explain why this situation has arisen. Knowledge sharing between the QS and the material suppliers, the other consultants, contractor and also with the client. Knowledge sharing happens through telephone, emails, mobile phones, story telling, pagers and faxes.

2.2.6 Contractual advice.

Based upon a general knowledge of law and a specialist knowledge and interpretation of the Law of Contract. The QS will give the advice and settlement of contractual matters. According to Ramus and Birchall (1996) the surveyor normally conducting the contractor's claims which is divided into three: 1) Common law claims; 2) Ex gratia claims; 3) Contractual claims.

1) Common law claims

These arise from causes which are outside the express terms of a contract. They relate to breaches by the employer or his agents of either implied or express terms of the contract, e.g. if the employer in some way hindered progress of the works or if the architect were negligent in carrying out his duties, resulting in loss to the contractor.

2) Ex gratia claims

These have no legal basis but are claims which the contractor consider the employer has a moral duty, e.g. if he has seriously underpriced an item whose quantity has been increased substantially because of a variation or the re-measurement of a provisional item, which will in consequence cause him considerable loss. The employer is under no obligation to meet such 'hardship claims' but may be prepared to do so on grounds of natural justice or to help the contractor where otherwise he might be forced into liquidation.

3) Contractual claims

These arise from express terms of a contract and form by far the most frequent kind of claim. They may relate to any or all of the following:

a) fluctuations b) variations c) extension of times d) loss and / or expense due to matters affecting regular progress of the works.

It is difficult when the surveyors have no previous record as a guider. The challenge is the QS must have the knowledge about the contract in details otherwise he/she cannot perform this job. The contractual adviser must be a person who is expert in building contract.

Knowledge sharing happens between the QS and the colleagues in the firms and also with the external people especially with the QS firm that provided the services for contractual advice. Knowledge sharing happens through telephone , emails, mobile phones, pagers, faxes, story telling, quality circles, mentoring and shadowing, coaching and job rotation.

2.2.7 Additional Services Provided Like Project Management, Value Management And Facilities Management.

This is the additional services provided by the quantity surveying firms to diversify their scope of services to better meet industry/client demands and to secure their long term future. According to Smith (2004) the survey that he had done showed that the proportion of income obtained from non traditional and non building work has risen markedly starting year 1995. The challenge for the surveyor is they have to increase the knowledge in financial management skills that can be applied in many different areas both within and outside the property industry. Knowledge sharing happens between the QS and the colleagues in the firms and also with the external people especially with the QS firm that provided same services and also with the company the provide this service as a core service.

2.3 Factors Influencing Knowledge Sharing

There is a paucity of research specifically in the area of knowledge sharing between individuals in organisation. This has been well documented (Ipe, 2003; Anumba et. al, 2005).

2.3.1 The Nature of Knowledge

The nature of knowledge means the most fundamental and common classification of organisational knowledge is along the explicit-tacit dimension. In this classification, explicit knowledge is considered to be formal and objective, and can be expressed unambiguously in words, numbers and specifications. Hence, it can be transferred via formal and systematic methods in the form of official statements, rules and procedures and so is easy to codify. Tacit knowledge, by contrast, is subjective, situational and intimately tied to the knower's experience. Thus, it is difficult to formalise, document and communicate to others. Insights, intuition, beliefs, personal skills and craft and using rule-of-thumb to solve a complex problem are examples of tacit knowledge (Daft, 2001).These two categories are closely interlinked so a bipolar map is difficult to draw in practice.

2.3.2 Motivation to Share and Trust

Motivation is an important concept in most theories of learning. It is closely related to encouragement, consideration, anxiety, and feedback. According to Stenmark, (2001), people are not likely to share knowledge without strong personal motivation. Motivational factors that influence knowledge sharing between individuals can be

divided into internal and external factors. Internal factors include the perceived power attached to the knowledge and the reciprocity that results from sharing. According to Davenport, (1997) if individuals perceive that power comes from the knowledge they possess, it is likely to lead to knowledge hoarding instead of knowledge sharing whilst Brown and Woodland, (1999) mentioned that individuals use knowledge for both control and defence.

External factors include relationship with the recipient and rewards for sharing (Ipe, 2003). External factors that influence the motivation to share knowledge is the relationship between the sender and the recipient. Relationship with the recipient includes two critical elements: (a) trust and (b) the power and status of the recipient. According to Ghoshal and Bartlett, (1994), trust is one of four primary dimensions in organisations influencing the actions of individuals. Huemer et al., (1998) further argued that even though the distribution of power matters in organisations, trust is more important as trust facilitates learning, and decisions to exchange knowledge under certain conditions are based on trust. Reward for sharing is another external factor. (Von Kortsfleisch and Mergel, 2001) identified that reward systems play an important part in motivation. Reward is defined as a situational condition which can motivate employees in a company to perform certain tasks with the expectation of receiving something in return. Knowledge and reward are interconnected.

2.3.3 Opportunities to Share

Opportunities to share knowledge in organisations can be both formal and informal. Bartol and Srivastava,(2002) referred to these as “formal interactions,” and Rulke and Saheer,(2000) called them “purposive learning channels”. Formal opportunities include training programs, structured work teams, and technology-based systems that facilitate the sharing of knowledge whereas the informal opportunities include personal relationships and social networks that facilitate learning and the sharing of knowledge (Brown and Duguid, 1991).According to Rulke and Saheer, (2000) these informal opportunities stated are “relational learning channels.”

2.3.4 The Culture of Work Environment

Schein, (1985), defined culture as the shared values, beliefs and practices of the people in the organisation. Cook and Yanow, (1993) mentioned that organisations are essentially cultural entities. Therefore irrespective of what organisations do to manage knowledge, the influences of the organisation’s culture are much stronger (McDermott and O’Dell, 2001). All the factors discussed before are crucial to understand the manner in which knowledge is shared between individuals. However, all of these factors are influenced by the culture of the work environment whether it is the culture of the subunit and/or the culture of the organisation at large (Ipe, 2003). Organisational culture is increasingly being recognised as a major barrier to effective knowledge creation, sharing, and uses (De Long and Fahey, 2000). According to McDermott and O'Dell (2001), companies that successfully implement knowledge management do not try to change their culture to fit their knowledge management approach but they build their knowledge management approach to fit their culture. As a result, there is not one right way to get people to share, but many different ways depending on the values and style of the organisation. Furthermore De Long and Fahey (2000), mentioned that organisation’s culture also shapes the perceptions and behaviours of its employees.

Cultures are not homogenous across an organisation (McDermott and O'Dell, 2001). Within organisations, there are also subcultures that are characterised by a distinct set of values, norms and practices, often resulting in their members valuing knowledge differently from other groups within the same organisation (Pentland, 1995). Subcultures and their influence on knowledge sharing add even more complexity to determining those practices and norms that create the right environment to facilitate the sharing of knowledge.

2.3.5 Openness

Matsler et al.,(2008) noted that openness is related with knowledge sharing and the previous studies from (Cabrera et al., 2006) have shown that openness also predicts learning and expertise. Openness is therefore the vital factors to be encouraged in knowledge sharing between individuals.

2.3.6 Time Pressure

According to Starbuck, (1992) time constraint is one of the factors that restrict the opportunities for sharing knowledge. However Anumba et al., (2005) added that deadline could stimulate knowledge sharing between team members so that time could be effectively managed with the risks error possibly diminished. Time pressure can act as a double-edged sword in the process of knowledge sharing.

2.4 How the Literature Review Informs Research in Knowledge Sharing in Quantity Surveying Firms.

From the discourse above on knowledge sharing and on the roles of the Quantity Surveyor, it becomes very clear that the role of quantity surveyors involve the sharing of knowledge on a host of areas to do with cost planning and cost economics. This supports the view by Anumba et. al. (2005) that construction is increasingly becoming a knowledge-base industry. The ways in which knowledge (tacit and explicit) sharing impact on organisational performance is complex and so are the different ways in which organisations exploit knowledge sharing for improved performance. The discussions above in previous sections of this paper indicate that effective sharing of knowledge involves a host of issues being addressed effectively. This includes issues to do with organisational strategy, organisational culture, issues of motivation, organisational politics, human resource issues, and knowledge sharing in teams and in supply chains, to mention but a few. Some of these issues are socially embedded. It therefore means to effectively study the effects of these factors and how they interact with one another within a Quantity Surveying practice calls for an appropriate understanding of relevant ontological and epistemological positioning of the researcher. The PhD on which this paper is based is currently at this stage where these issues are being explored. The ontological and epistemological positioning of the researcher also informs the research methods that are likely to be adopted. It is becoming clear as the research progresses that issues to do with how organisational culture impact upon knowledge sharing in quantity surveying practices are socially embedded and likely to warrant a qualitative approach to uncover such issues. These and other research methodological issues are currently being explored and the findings and learning outcomes of these would be presented in another paper.

3 Research Methodology

This paper is part of an on-going PhD research entitled “The impact of effective knowledge sharing initiatives on Quantity Surveying Practices in the Malaysian construction industry”. The PhD research will employ a combination of both qualitative and quantitative approaches. According to Miles and Huberman, (1994) qualitative research is conducted through an intense and/or prolonged contact with a `field' or life situation. These situation are typically `banal' or normal, reflective of the everyday life of individuals, groups, societies, and organizations whilst quantitative research is characterized by the assumption that human behaviour can be explained by what may be termed `social facts’ which can be investigated by methodologies that utilize `the deductive logic of the natural sciences’(Horna, 1994).A qualitative research approach should help to address socially embedded issues in detail(Cresswell, 2002). A quantitative approach in this study should help target a larger number of proposed respondents, allowing the solicitation of broader perspectives and view points from potential respondents (Creswell, 2002).Prior to the actual data collection, a pilot study (pilot study- a small scale replica and a rehearsal of the main study, Sarantakos, 2005) using semi structured interviews will be conducted on large, medium and small Quantity Surveying practices in Malaysia. A pilot study provides an opportunity to test out some objectives, research questions, and to explore methods (Yin, 1994), allowing any changes or amendments to be made before the main study is conducted. However, this paper is primarily based on a thorough review of relevant literature in the areas of knowledge sharing, organisational culture, and structure from Quantity Surveying Firms' perspectives. The articles reviewed in this paper have come from journals, text books, conference proceedings and websites.

4 Conclusion and Further Research

Knowledge is a critical factor affecting an organisation’s ability to remain competitive in the new global marketplace. Knowledge sharing is the corner-stone of many organisations’ knowledge management strategy. Knowledge sharing in organisation is the act of making knowledge available to others within the organisation. In doing their roles the quantity surveyors face many challenges to inhibit the implementation of knowledge sharing initiatives within QS firms. Many of the challenges in organizations face in managing their knowledge assets are influenced by the culture of the subunit and/or the culture of the organisation. The companies that successfully implement knowledge management do not try to change to fit their knowledge management approach but they build their knowledge management approach to fit their culture. As a result, there is not one right way to get people to share, but many different ways depending on the values and style of the organisation. The nature of knowledge sharing in QS firms and the complexities associated with it mean that the choice of research methodology and methods need to be robust and appropriate. Associated issues of culture and motivation of employees in knowledge sharing means that a qualitative approach to research is needed. The next stages of this ongoing study involve developing a conceptual framework and conducting a pilot study. Findings from the study should positively inform the proposed main study.

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Critical Success Factors for Knowledge Management Implementation in Organisations: Proposing an Agenda for Performance Improvement in the Construction Industry

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Abstract:
Knowledge management (KM) is of growing interest in today's business. With the importance of KM being realized, businesses are viewing KM as a critical success factors (CSF) in today's dynamic borderless society. Making knowledge available to the right people at the right time is crucial for building and sustaining an organisation's competencies. As knowledge of an organisation exists in the people, processes, products and other organisational foundation, successful implementation of knowledge management highly depends on the understanding and influencing people attitudes, corporate culture and physical structure of the organisation. CSFs have been used significantly to present or identify a few key factors that an entity should focus on in order to be successful. This paper aims to review and synthesis the studies done on the CSFs for knowledge management. It points out a number of success factors that were determined to be critical and affect knowledge management in organisations for various industries and, with the aim of providing recommendations of CSFs that can be applied generically across the construction industry for the purpose of performance improvement.

Keywords:
Construction industry, critical success factors, knowledge management, knowledge management implementation, performance improvement

1 Introduction

Many organisations are exploring the field of knowledge management (KM) in order to improve and sustain their competitiveness (Wong, 2005). Currently, KM is steadily becoming an integral business activity for organisations as they realise that competitiveness is critical to the effective management of knowledge (Grover and Davenport, 2001). The increasing globalisation of business, the shift from production-based to a knowledge-based economy (k-economy), the growth of information communication technology (ICT), the strive to becoming learning organisations and the emergence of knowledge workers (k-workers) (Chong and Choi, 2005) imply that an

organisation's ability to effectively create, retain, communicate, use and manage its knowledge is critical for organisational success (Marquardt, 1996).

KM consists of an emerging set of organisational designs, processes, structures, operational principles, integrated managerial strategies, and technological applications that help knowledge workers significantly influence their creativity and ability to deliver business value (Gurteen, 1998; Hung et.al. 2005). KM is a managerial activity which develops, transfers, transmits, stores, and applies knowledge, as well as provides members of the organisation with real information to react and make the right decisions in order to attain the organisation's goals (Hung et al., 2005). However, the impact of KM adoption in terms of performance improvement and related benefits are still elusive (Choi, 2000). Organisations are becoming more knowledge-intensive and as a result, knowledge has been treated systematically like other tangible resources and many organisations are exploring the field of KM in order to improve and sustain their competitiveness (Wong, 2005). Wong (2005) added that there is a crucial need for a more systematic and deliberate study on CSFs for implementing KM. Organisations need to be aware of the factors that will influence the success of a KM initiative. CSFs have been identified and recognised as fundamental for organisation success and better performance in several activity domains. Thus, the concept of CSFs defined by Rockart in 1979 who identified operational goals shaped by the industry, the firm, the manager, and the broader environment that, if satisfactory, will ensure successful competitive advantage for the organisation (Laudon and Laudon, 2004). It is clear from this definition that CSFs provide management with the ability to focus attention on the major activities that need to be performed effectively in order for the business to improve their performance (Laudon and Laudon, 2004).

Within construction industry, there is no general consensus on a single unified meaning of KM concept (Egbu, 2004). However, Egbu (2004) added that knowledge is an important resource for construction organisations due to its ability to provide market leverage and contributions to organisational innovations and project success. The potential benefits of effectively utilising their knowledge has meant that an increasing number of companies have identified the need to implement KM initiatives. On the other hand, the difficulties associated with understanding and managing organisational knowledge has meant that organisations experience numerous problems in successfully implementing and sustaining their initiatives (Egbu, 2004).

Based on previous studies on CSFs in construction industry, instead of examining organisation management practices, the identification of CSFs has been focused on the project level. This adoption of the bottom-up approach in the construction industry versus the top-down in other industries has limited the development of construction organisations as business practice leaders. Whereas, studies done on CSFs in many other industries, were more focused on organisational level. Therefore, the need for a more systematic and deliberate study on the critical success factors (CSFs) for implementing KM in construction organisations is crucial. Organisations need to be aware of the critical factors that will influence the success of a KM initiative. Ignorance and oversight of the necessary important factors will likely hinder the organisations effort to realise its full benefit. The paper aims to review and compare the existing critical factors suggested by different scholars in the literature for successful knowledge

management implementation with the aim that these factors can be adopted in construction industry for the purpose of performance improvement.

2 Literature Review

2.1 Definition of Knowledge Management

A review of current literature reveals numerous definitions of KM due to wide range of interests, perspectives, and issues represented by various authors. Therefore, defining the concept of KM is difficult, as differing viewpoints or schools of thought can yield different dimensions and meanings. Although today there is a great deal of interest in knowledge management (KM), no universally accepted definition of KM exists (Earl and Scott, 1999). Many authors had defined KM as a management process in an organisation. KM is to discover, develop, utilize, deliver, and absorb knowledge inside and outside the organisation through an appropriate management process to meet current and future needs (Quintas et. al., 1997). Gurteen (1998) define KM as "an emerging set of organisational design and operational principles, processes, organisational structures, applications and technologies that helps knowledge workers dramatically leverage their creativity and ability to deliver business value". Bukowitz and Williams (1999) in their research define KM as "the process by which the organisation generates wealth from its intellectual or knowledge-based assets". Allee (1997); Davenport (1998); and Alavi and Leidner (2001), had a same definition of KM where "KM is managing the corporation's knowledge through a systematically and organisationally specified process for acquiring, organising, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organisational performance and create value". KM is a process that helps organisations find, select, organise, disseminate, and transfer important information and expertise necessary for activities (Gupta et. al., 2000).

Another perspective of KM definition is that KM involves knowledge creation. KM is a process of knowledge creation, validation, presentation, distribution and application (Bhatt, 2001). Horwitch and Armacost (2002) view KM as "the creation, extraction, transformation and storage of the correct knowledge and information in order to design better policy, modify action and deliver results". The following authors have a same idea on KM in relation to the whole approach of KM. Wunram (2000) perceives KM as a systematic, goal-oriented application of measures to steer and control the tangible and intangible knowledge assets of organisations, with the aim of using existing knowledge inside and outside of these organisations to enable the creation of new knowledge, and generate value, innovation and improvement. It was agreed by Jones (2003) who had defining KM as an integrated, systematic approach to identify, manage, and share all of the department's information assets, including databases, documents, policies and procedures, as well as previously unarticulated expertise and experience resident in individual officers. Hung et. al. (2005) describe KM as a systemised and integrated managerial strategy, which combines information technology with the organisational process. They added that KM is a managerial activity which develops transfers, transmit, stores and applies knowledge, as well as providing the members of the organisation with real information to react and make the right decisions, in order to attain the organisation's goals.

2.2 The Critical Success Factors

Critical success factors (CSFs) have been used significantly to present or identify a few key factors that organizations should focus on to be successful. Identifying CSFs is important as it allows organizations to focus their efforts on building their capabilities to meet the CSFs, or even allow them to decide if they have the capability to build the requirements necessary to meet the CSFs. In literature, several definitions of CSF exist. Representing one of the most frequently cited definitions, Rockart (1979) who uses ideas from Daniel (1961) and Anthony et al. (1972) defines CSF as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right for the business to flourish. If the results in these areas are not adequate, the organization's efforts for the period will be less than desired." Consequently, Rockart (1979) stresses, that these particular areas of activity should be constantly and carefully managed by a company. In a similar idea, Bruno and Leidecker (1984) identify CSF as "those characteristics, conditions or variables that, when properly sustained, maintained, or managed, can have a significant impact on the success of a firm competing in particular industry", while Pinto and Slevin (1987) regard CSF as "factors which, if addressed, significantly improve project implementation chances". However, according to Esteves (2004), both of these definitions fail to address the comprehensive concept proposed by Rockart (1979), which seeks to identify an ideal match between environmental conditions and business characteristics for a particular company. Saraph et al. (1989) view CSFs as "those critical areas of managerial planning and action that must be practiced in order to achieve effectiveness". In the area of KM, CSFs can be viewed as "those activities and practices that should be addressed in order to ensure its successful implementation" (Wong, 2005). These practices would either need to be nurtured if they already existed or to be developed if they were still not in place.

The advantages of identifying CSFs are that they are simple to understand; they help focus attention on major concerns; they are easy to monitor; and they can be used in concert with strategic planning methodologies. Using CSFs as an isolated event does not represent critical strategic thinking. But when used in conjunction with a planning process, it is extremely important to identify CSFs because it keeps people focuses. The identification of CSFs will enable the limited resources of time, manpower and money to be allocated appropriately (Chua et.al., 1999). A clear understanding of these factors will be instrumental in overcoming constraints caused by the higher demand of construction clients. The set of CSFs can act as a list of items for organisations to address when adopting KM. This helps to ensure that the essential issues and factors are covered during design and implementation phase.

2.3 Review of CSFs for KM Implementation

Since the late 1990s, many researchers have attempted to develop a comprehensive list of CSFs for KM implementation. However, the list differs because of the multidisciplinary nature of KM. A set of CSFs for practising KM was reported by Skyrme and Amidon (1997) and they suggest seven key success factors based on lessons drawn from an international study of practices and experiences of leading companies in KM. The seven factors are knowledge leadership; a knowledge creating & sharing culture; a well-developed technology infrastructure; strong link to a business imperative; a compelling vision and architecture; systematic organisational knowledge

processes; and continuous learning. Aligned with this type of approach, Davenport et. al. (1998) conducted a study to explore the practices of 31 KM projects in 24 organisations. For those projects that were deemed successful, eight major factors were then inferred to have contributed to their effectiveness. The factors are senior management support; knowledge-friendly culture; technical infrastructure; standard and flexible structure; clear purpose and language; link to economic performance/ industry value; organisation infrastructure; multiple channels for knowledge transfer; and change in motivational practices. Similarly, Liebowitz (1999) proposes six key ingredients for making KM successful, based on lessons captured from leading companies in the field. He suggests the need for a KM strategy with support from senior management, a chief knowledge officer (CKO) or equivalent and a KM infrastructure, knowledge ontologies and repositories, KM systems and tools, incentives to encourage knowledge sharing and a supportive culture.

A different approach was taken by Holsapple and Joshi (2000) in their study. Their primary aim was to develop a descriptive framework for characterising the factors that influenced the success of KM. These factors were derived theoretically from various literature sources, and a "Delphi" study was used to assess their appropriateness. As a result, they had identified the success factors as leadership; measurement; control coordination; and resources.

McDemott & O'dell (2001) has done a study with five American companies on the impact of organisational culture on knowledge sharing. They found that culture plays an important role in the success of knowledge management efforts. They said that the approach, tools and structures to support knowledge sharing should match the style of the organisation and networks for sharing knowledge should be built on existing networks people use in their daily work. Hasanali (2002) has categorised the critical success factors into five categories. These are: Leadership; Culture; Structure; Roles and responsibilities; IT infrastructure; and KM measurement. The factors include motivation of employees, company culture, support from top management, reward of knowledge sharing, efficiency for mining the knowledge and appropriate information technology. According to Hasanali, measuring the effectiveness of KM is important to promote sharing. People are not sure how to link KM efforts to the Return on Investments (ROI). As there are many variables that affect a business outcome, isolating the results of knowledge sharing activities is difficult. That is why there is a need to correlate the KM activities with business outcomes.

Bixler (2002) develops a four pillar model to describe success factors for a KM implementation. To achieve a basic entry level KM program, it has been determined that all `four pillars` must be addressed. The four enterprise engineering pillars are leadership, organization, technology and learning in support of enterprise wide knowledge management initiatives. Leadership means that managers develop business and operational strategies to survive and position for success in today's dynamic environment. Those strategies determine vision, and must align knowledge management with business tactics to drive the value of KM throughout the enterprise. Focus must be placed on building executive support and KM champions. Chourides, et al. (2003) had done a research that deal with key staff within eight case organisations which are at various stages of approaching and deploying KM programs. It builds upon previous survey work (Longbottom and Chourides, 2001) to establish practice and key factors

likely to enhance successful implementation. Specifically it assesses a range of critical factors and identifies appropriate measures over five organisational perspectives: strategy; people/human resource management; information technology; quality and marketing.

Hung, et. al. (2005) had determined seven critical factors to the implementation of KM system (KMS) in pharmaceutical industry. The factors are; a benchmarking strategy and knowledge structure; the organisational culture; information technology; employee involvement and training; the leadership and the commitment of senior management; a learning environment and resource control; and evaluation of professional training and teamwork. This study has determined that the pharmaceutical industry has paid special attention to benchmarking strategy. Adopting a KMS can be easy with a core department to maintain proper function of the system. However, companies should utilise the intangible assets available through a KMS to attain full participation from the employees to ensure the success of implementing an effective KMS (Hung, et. al., 2005). Chong and Choi (2005) had stated that successful deployment of a KM programme depends on eleven (11) critical enablers such as employee training, employee involvement, teamwork, employee empowerment, top management leadership and commitment, organisational constraints, information system infrastructure, performance measurement, egalitarian culture, benchmarking and knowledge structure. Similarly, Wong (2005) identifies 11 factors that are critical for the success of KM but his focus was on small and medium enterprises (SMEs). The factors include the management and leadership support; culture; information technology; strategy and purpose; measurement; organisational infrastructure; processes and activities; motivational aids; resources; training and education; and human resource management.

Within the construction industry, Bishop et.al. (2008) had done a study to identify a set of CSFs, which ensure the effectiveness of KM initiative before, during and after their implementation, within the context of UK-based construction organisations. The research focus on the effect of people-oriented success factors in the field of construction industry. In a research done by Lin and Lin (2006), they identify several factors that are critical for the success for implementing KM in construction projects from Taiwan perspective which used a case study from the oil and gas sector to explore the KM activities of 8 leading organisations and investigate the opportunities for construction organisation.

Based on the literature review, some observations can be made. First, the proposed CSFs are fragmented and diversified. Secondly, many studies on CSFs are narrowly scoped i.e. none of the frameworks proposed earlier provide a generalised frame for defining the fundamental attributes of KM and their interrelationships due to the different background and interests of KM researchers.

3 Research Methodology

The study began with a review of relevant materials from textbooks, journals, conference papers, refereed publications, research reports, and internet information to capture the background of knowledge and knowledge management in general. Existing

studies on CSFs were then reviewed and their limitations were identified. By integrating insights from previous studies, the author had discussed a set of eleven (11) CSFs which is believed to be common in KM implementation and how it can be adopted for performance improvement in construction industry. The purpose of the literature review was to find research gap, to develop a research framework and to establish future research programme.

4 Analysis and Discussion

Different sets of CSFs have been put forward by different authors. These factors can possibly be group into 11 most common factors such as management and leadership support; culture; technology; strategy; measurement; roles and responsibilities; processes and activities; motivation; resources; training and education; and human resource management. These are common in KM efforts and therefore, they are also believed to be applicable to many other industries (Wong, 2005).

Management and leadership support

Management leadership plays a key role in influencing the success of KM (Skryme and Amidon, 1997; Davenport, et. al., 1998; Liebowitz, 1999; Holsaple and Joshi, 2000; Hasanali, 2002; Bixler, 2002; Hung et. al., 2005; Wong, 2005; Chong, 2006). Leaders are important in acting as role models to show the desired behaviour for KM. For example, they should show a willingness to share and offer their knowledge freely with others in the organisation, to continuously learn, and to search for new knowledge and ideas (Wong, 2005). It is vital for them to model their behaviours and actions through deeds, not just words. These actions can further influence other employees to imitate them and increase the propensity of employees to participate in KM. Other leadership competencies that would be important include steering the change effort, conveying the importance of KM to employees, maintaining their morale, and creating a culture that promotes knowledge sharing and creation. In essence, leaders establish the necessary conditions for effective KM (Holsaple and Joshi, 2000). Knowledge leadership qualities can be developed in individuals throughout the organisation (Skryme and Amidon, 1997). As with all change and improvement programmes, the support and commitment from senior management is critical to KM initiative (Davenport et al., 1998).

Culture

Organisational culture is another important factor for successful KM (Davenport et al., 1998; Hung et al., 2005; Wong, 2005; Hasanali, 2002). Wong (2005) had defines culture as the core beliefs, values, norms and social customs that govern the way individuals act and behave in an organisation. In general, a culture supportive of KM is one that highly values knowledge and encourages its creation, sharing and application. The biggest challenge for most KM efforts actually lies in developing such a culture (Wong, 2005). A survey result reported by Chase (1997) affirms that culture was the largest obstacle faced by organisations in creating a successful knowledge-based enterprise. In fact, it has been asserted that the success of KM is 90 per cent dependent on building a supportive culture (Liebowitz, 1999). Important facets of a knowledge-

oriented culture include such attributes as trust, collaboration and openness (Wong and Aspinwall, 2005).

Technology

It is indisputable that information technologies such as document management systems, information retrieval engines, relational and object databases, groupware and workflow systems, push technologies and agents, and data mining tools (Offsey, 1997) can facilitate KM. However, technology should not be seen as an absolute answer to KM, since it is only a tool. Important factors that need to be considered in the development of a KM system include simplicity of technology, ease of use, suitability to users' needs, relevancy of knowledge content, and standardisation of a knowledge structure or ontology (Wong, 2005).

Strategy and purpose

Another important criterion for effective KM is to have a clear strategy and purpose. A rational strategy helps to clarify the business case for pursuing KM, and steer the company towards becoming knowledge-based (Wong and Aspinwall, 2005). This provides the foundation for how an organisation can deploy its capabilities and resources to achieve its KM goals (Liebowitz, 1999). The development of a compelling and shared vision for pursuing KM is closely related to the notion of strategy. It is essential that employees support this vision and believe that it will work. In addition, clear objectives, purposes and goals need to be set and understood by everyone involved.

Measurement

According to Arora (2002) and Ahmed et al. (1999), measuring KM is necessary in order to ensure that its envisioned objectives are being attained. Measurement enables organisations to track the progress of KM and to determine its benefits and effectiveness. Essentially, it provides a basis for organisations to evaluate, compare, control and improve upon performance of KM (Ahmed et al., 1999).

Another key aspect of measurement is to evaluate the impact that KM has a bottom line financial result (Wong, 2005). Some of the methods being used for measurement include intellectual capital metrics (Sveiby, 1997) and the balanced scorecard (Kaplan and Norton, 1992; Arora, 2002). Nevertheless, there is still no absolute method for measuring KM in an organisation (Gupta et al., 2000), and this is an area which is still being explored by academics and practitioners (Gooijer, 2000).

Roles and responsibilities

An extensive use of organisational infrastructure helps employees to create, share and transfer knowledge within the organisation, establishing a set of roles and teams to perform knowledge-related tasks (Davenport and Klahr, 1998). In spite of the fact that some existing functions in an organisation such as HRM and IT, have already been working with knowledge issues it is critical to determine a group of employees with specific and formal responsibilities for KM (Wong, 2005). One of the more commonly

mentioned roles in the literature is the Chief Knowledge Officer (CKO) or equivalent who takes the leading role to coordinate, manage and set the course for KM (Earl and Scott (1999); Grover and Davenport (2001)).

Processes and activities

Processes and activities are another key factor that affects the adoption of KM. This relates to how knowledge in the organisation is managed (Johannsen, 2000). There are several processes and activities that characterise the KM discipline (Wong, 2005), and the literature highlighted a number of processes associated with KM. For example, Alavi and Leidner, (2001) discerned four main processes for KM, namely, creation, storage/retrieval, transfer and application. Appropriate intervention and mechanisms need to be in place to ensure that KM processes are addressed in a systematic and structured manner (Wong, 2005). Therefore, coordination of the KM processes to be performed is crucial (Holsapple and Joshi, 2000).

Motivation

Much of an organisation's most valuable KM is embedded in the minds of its employees (Hasanali, et.al, 2001), and that KM, in turn can be managed only through enthusiasm that excites the deepest parts of the employees' minds (Amar, 2004). One of the important factors is to establish the right incentives, rewards or motivational aids to encourage people to share and apply knowledge. If individuals are not motivated to practise KM, no amount of investment, infrastructure and technological intervention will make it effective (Wong, 2005). Giving incentives to employees helps to stimulate and reinforce the positive behaviours and culture needed for effective KM. Incentive systems should be focused on criteria such as knowledge sharing and contribution, teamwork, creativity and innovative solutions, in order to build a knowledge-based enterprise.

Resources

Several authors (Holsapple and Joshi, 2000; Wong and Aspinwall, 2004; Wong, 2005; Al-Mabrouk, 2006) identify some significant resources for successful KM implementation such as financial support, human resources and time. Financial resource availability may affect the execution of leadership, coordination, control, and measurement (Holsapple and Joshi, 2000). It is undoubtedly required if an investment in technological capabilities is made. Human resources are needed to coordinate and manage the implementation process as well as to take-up knowledge-related roles (Wong, 2005). Since time is also considered when KM is implemented, therefore organisations have to free uptime for their employees to perform KM activities, such as knowledge sharing (Wong, 2005). Since resources availability is a primary concern in organisations, it should be considered when adopting a KM initiative (Wong, 2005; Holsapple and Joshi, 2000).

Training and education

In order to create awareness and to have better understanding of the concept of KM, organisations members need to be given training and education (Moffett et al., 2003). It

also helps to frame a common language and perception of how they define and think about knowledge (Wong, 2005). Employees could also be trained and educated in using the KM system and other technological tools for managing knowledge. This helps to ensure that they can utilise the full potential and capabilities offered by these tools (Wong, 2005). Wong added that training for individuals to understand their new roles for performing knowledge-oriented tasks might be needed and suggested that for effective KM, skills development should occur in the following areas: communication, soft networking, peer learning, team building, collaboration and creative thinking. Similarly, Yahya and Goh (2002) show that training is related to creativity, team building, documentation skills and problem solving and had a positive impact on the overall KM process.

Human resource management (HRM)

The significance and roles of HRM in KM have been discussed by a number of authors (eg. Soliman and Spooner, 2000; Garavan et al., 2000; Brelade and Harman, 2000). While it is important to KM for many reasons, the main focus is on the issues of employee recruitment, development and retention. Effective recruitment of employees is crucial because it is through this process that knowledge and competences are brought into the organisation (Wong, 2005). Wong also suggested that effective development is seen as a way to improve and enhance the personal value of individuals. The skills and competences of knowledge workers need to be continuously developed in order for them to produce valuable contributions to a company. In order to retain employees to work for a company, it is important to provide opportunities for them to grow and to advance their career. Brelade and Harman (2000) suggest that human resource policies and practices need to be designed to allow employees to meet their personal aspirations.

5 Conclusion and Further Research

The effective implementation of KM is governed and facilitated by certain factors. Organisations can certainly benefit from a more thorough understanding of the factors that are critical to the success of KM. However, the application or adoption of factors which are not suitable can hinder the achievement of the desired performance. As such, considerable care must be exerted in the development of CSFs for KM so that the CSFs identified can provide a basis for any organisation to evaluate their KM practices. This paper has shown that there are many factors that are critical for KM implementation. Organisations can certainly benefit from a more comprehensive understanding of the factors and it can act as a list of items for organisations to address and deal with when accomplishing KM. This helps to ensure that essential issues and factors are covered when they are planning and developing KM. It can also provide a basis for them to evaluate their KM practices at a later stage.

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Decision Making Process for Procuring Support Services in the Public Healthcare Sector: A Comparative UK and Malaysia Study

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Abstract:
This is an initial position paper concerning the procurement of non-core activities or support services, specifically in the public healthcare sector. It reviews the literature related to decision making in outsourcing support services in a range of sectors and attempts to describe the decision making process implicit in procuring the support services for the public healthcare sector. It also discusses the drivers, advantages and disadvantages of outsourcing. Outsourcing (known as privatisation in Malaysia) is part of the Malaysian national agenda as stipulated under the Seventh Malaysian Plan and the intention of the research is to identify effective UK process which could be transferred into a Malaysian context. A pilot questionnaire will be carried out with several NHS Trusts in the UK to determine their approach to support services procurement and the decision making process taken prior to selection. The data received is expected to demonstrate a diversity of practices, behaviour patterns and attitudes amongst the respondent organisations. The feedback received, and the outcome from the pilot survey, will help to shape the future of the research to be undertaken.

Keywords:
Decision making, Outsourcing, Public healthcare, Support services

1 Introduction

With globalisation and rapid changes in technologies, organisations have to strive to remain competitive in the marketplace. Outsourcing is one of the strategies for organisation to remain competitive. The practice of outsourcing has seen phenomenal growth over the past few years. Outsourcing is not a new concept (Winkleman et al., 1993; Russell and Taylor, 2003; Yang and Huang 2000), but the subject of strategic outsourcing is relatively recent and the research literature is only currently starting to identify its potential contribution to organisations. The practice of outsourcing has spread into all industries ranging from automobile manufacture to healthcare. It has been engaged since organisation started using outside consultants or providers to help

them with variety of activities, such as information technology, accounting, payroll, maintenance and catering. The difference now is the range of services provided.

Van Heok (1999) argued that the correct balance between vertical integration (in-house) and the use of outside supply will differ between industries; and firms within industries (Blumberg, 1998). The extent of outsourcing in the public sector should relate to the culture of the state; consumerist cultures may find outsourcing of core sector services more acceptable than in less consumerist states (Hood, 1997). Outsourcing can be considered as a continuum. Mylott (1995) views outsourcing in terms of full outsourcing, selective outsourcing and everything-in-between outsourcing.

Harland et al. (2005) are at the opinion that outsourcing is not just for support services but also for activities 'closer to core'. In the same vein, Gilley and Rasheed (2000) proposed two generic types of outsourcing namely peripheral outsourcing and core outsourcing. The first type occurs when firms acquire less strategically relevant, peripheral activities from external suppliers. The second type occurs when firms acquire activities that are considered highly important to long-run success.

Outsourcing in the healthcare sector can be a cost-effective way to provide health services because it brings an additional knowledge, expertise, and infrastructure, and enables health organisation to compete by focusing on their main goal of health service production for patients (Mackey et al., 2004; Neil, 2004; Colona and McFaul 2004). It has become a strategic tool used by health care management to control costs without, it is claimed, affecting patient care (Colona and McFaul 2004). This paper presents an overview of the decision making in outsourcing the support services in the public healthcare sector, particularly in Malaysia.

2 Outsourcing

2.1 Definition

Chase et al (2004) defined outsourcing as the act of moving some of an organisation's internal activities and decision responsibilities to outside providers. On the other hand, Lankford and Parsa (1999) define outsourcing as the procurement of products or services from sources that are external to the organisation. Moreover, Fan (2000) defines outsourcing as the contractual agreement between the customer and one or more suppliers to providing services or processes that the customer is currently providing internally.

Outsourcing involves a transfer of management responsibility for the delivery of services and internal staffing patterns to an outside organisation (Moschuris and Kondylis, 2006). Gilley and Rasheed (2000) identified outsourcing as procuring something that was either originally outsourced internally (i.e. vertical disintegration) or could have been sourced internally notwithstanding the decision to go outside.

Subcontracting, contracting out, staff augmentation, flexible staffing, employee leasing, professional services, contract programming, consulting and contract services are all terms which refer to outsourcing (Sarpin and Weideman, 1999).

2.2 Strategic Outsourcing

An organisation's sourcing strategy needs to reflect the organisation's own approach to developing competitive advantage and its business context (Jennings, 2002). Outsourcing is not just a costing exercise; it has strategic dimensions as the organisation attempts to find the right form to fit new business environments (Rothery and Robertson, 1995). To achieve the strategy of cost reduction and shorter lead-times, organisation sought to concentrate on their own capabilities and use outsourcing as a means for efficient exploitation of available resources (Dekkers, 2000).

Quinn et al (1990) asserted that moving to a less integrated but more focused organisation is imperative for competitive success. The perception of outsourcing is no longer for short-term lowering of direct costs, organisation should look into strategic outsourcing. Therefore, organisation can lower their long-term capital investments and leverage their key competencies significantly (Quinn and Hilmer, 1994). Organisations can use outsourcing to leverage the organisation's internal and external resources, capabilities and competencies. The operational make-buy literature has evolved from primarily economic perspectives focusing on minimisation of costs, evolving to add an intellectual capital perspective that accounts for distinctive competence implications, and further growing to consider supply risks (Mantel, 2006).

2.3 Outsourcing Strategy

Outsourcing strategy can be conceptualised as having two fundamental properties, breadth and depth. Breadth is defined as the number of activities (i.e. accounting, maintenance, machining) outsourced as a percentage of the total number of activities in which the organisation could be engaged. Depth is the extent to which an organisation outsources a higher portion of that activity on average (Gilley and Rasheed, 2000). The key to deciding what to outsource rests with those elements that differentiate the organisation, especially in the areas of value and quality (Fill, 2000).

As for the healthcare sector, outsourcing occurred more often in non-clinical services than clinical services. Considering which areas were to be outsourced were made on the bases such as characteristics of the labour market, including employee level skills and availability of labour, the nature of industrial relations and the perception of what was core in relation to patient care, though that perception was inconsistent (Young, 2005).

Studies undertaken in Greece (Moschuris & Kondylis, 2006) exhibited that the activities being most outsourced in public healthcare sector were cleaning, security, cafeteria, legal and clinical/equipment maintenance. On the other hand, the activities being least outsourced were laundry, laboratory and food. Moreover, literature from Yigit et al. (2007) indicated that the public healthcare sector in Turkey outsourced information systems, cleaning, maintenance, leased medical devices and food services. In addition, the least outsourced services were patient satisfaction measurement services, consultancy services; and financial and investment services.

Another study carried out in Australia revealed that not only non-core (non clinical) activities such as car parking, garden and ground maintenance, supply management, catering, cleaning, security, ward support and distribution were being outsourced, core (clinical) activities such as pathology, radiology and dental technicians were also being

outsourced. This happened when political factors intervened in the decision making, through either problems with managing staff or changes to external funding (Young, 2005).

However, organisations had to be cautious as mistakes in identifying core and non-core activities can lead them to outsource their competitive advantage (Harland, 2005). Selecting the right service to outsource will lead to positive results provided that the organisation understands the characteristics of the right service such as clearly non-core, easy to measure and with low transaction frequency.

2.4 Drivers of Outsourcing

The initiator to outsource can be from the policy created by the government (Young, 2005). However, there are various reasons that motivate organisations to outsource. Research carried out by Fan (2000) revealed that the reasons for adopting outsourcing were cost reduction, focus on core competencies, improving quality, lack of internal skills or expertise, entry barriers (capital equipment, technology etc) and capacity.

As for the public healthcare sector, the main reasons to outsource are to decrease costs, increase flexibility and share risk; and increase the quality of services rendered (Yigit et al., 2007). In addition, Moschuris and Kondylis (2006) are of the opinion that what motivated organisation to outsource are due to response to demands created by such factors as market pressures, requirements of managed care organisations, mergers and acquisitions and competition within the industry. In the same vein, Young (2005) argued the reasons for outsourcing of public healthcare were to reduce costs and increase efficiency, focus on core competency, workforce flexibility, reduce the problem of managing industrial relations, personal objectives of decision makers, the desire to align public sector agencies with the ideology of the government providing the fund, and the desire to improve department management, specifically related to their skill levels and their familiarity with new operating procedures.

While cost and strategy may drive private organisations, the desire for the general well being of citizens may drive outsourcing by public organisations (Kremic et al., 2006). The agendas of elected officials, public opinion and current national or internal trends are other factors that motivate outsourcing by the public sector (Avery, 2000). Although there are differences in the drivers of outsourcing between the private and public sectors, the desired benefits are often similar (Kremic et al., 2006). However, it is important to note that the cost of outsourcing is not just the cost of the services, but also includes the costs of setting up relationships and monitoring and coordinating the supplier's activities (Williamson, 1979).

Outsourcing when applied judiciously through cost and risk analysis is a cost-effective approach that can be used by most hospitals (Yigit et al., 2007). It is to be noted that savings did not occur through wage reductions, but rather by changing work processes, rosters and technology (Young, 2005).

2.5 Advantages and Disadvantages

Outsourcing has compelled organisations to focus on core activities, reduce costs, provide short-term financial benefits, and balance sheet improvements (Harland et al,

2005). Fan (2000) found that the advantages of outsourcing are cost reduction, freeing up of internal resource, service level improvement, quality improvement and flexibility. Outsourcing has created efficiency gains and to allow organisations to focus more clearly on those activities that it can better perform in-house (Hendry, 1995).

Outsourcing non-core activities allows the organisation to increase managerial attention and resource allocation to those tasks that it does best and to rely on management teams in other organisations to oversee tasks at which the outsourcing organisation is at a relative disadvantage. Thus, outsourcing may be an attractive method of improving an organisation's financial performance, especially in the short run (Gilley and Rasheed, 2000). By outsourcing non-critical functions, an organisation can leverage its financial resources, share its financial risk and allow management to concentrate more fully on core business activities (Fill, 2000).

As asserted by Moschuris and Kondylis, (2006), healthcare organisations outsourced a variety of activities and the major benefits from using outside services are improved performance, cost savings and increase management time in the core business. However, precaution has to be taken as long-term outsourcing contracts that have a feature of short-term savings can prove to be very expensive in the later stages (Okoroh et. al., 2001).

Loss of critical skills and knowledge, possible leakage of critical knowledge realise cost savings, dependence on suppliers, low morale of permanent employees and increased monitoring and contract management costs are identified as the disadvantages of outsourcing (Jennings, 2002; Young, 2005). In addition, Fan (2000) indicated that outsourcing may face the failure to deliver against expectations, implementation, potential job losses and contractual issues relating to specification and accurate supplier measurement.

One of the most serious threats resulting from a reliance on outsourcing is declining innovation by the outsourcer (Gilley and Rasheed, 2000). In addition, as suppliers gain knowledge of the product being manufactured, they may use that knowledge to begin marketing the product on their own (Prahalad and Hamel, 1990).

3 Decision Making

The key issues in the sourcing decision are either vertical integration or outsourcing (McIvor, 2000). An organisation’s sourcing strategy needs to be consistent with competitive conditions and the development of competitive advantage (Quinn and Hilmer, 1994; Harrigan, 1986). This is because outsourcing decision can impact on flexibility, customer service and the core competencies of the organisation (McIvor, 2000).

Decision making on outsourcing takes place at strategic, tactical and operational levels within an organisation (Dekkers, 2000). Michel (2007) added decision making is a linchpin between the CEOs power, the delegation of authority and the performance of an organisation. Nevertheless, Fan (2000) opined that outsourcing decisions gravitated away from the centre of the organisation, as most outsourcing was of support activities and decisions were not made at the board level.

Welch and Nayak (1992) consider that while cost is always important in any business decision, managers should consider strategic and technological issues. Ngwenyama (1999) highlighted that although the basic argument for outsourcing is cost saving due to the supplier's economies of scale and labour specialisation, the decision to outsource important value chain activities to external entities cannot be based on the cost of service/product alone. He suggests managers consider as follows:-

i) Risks and benefits of different outsourcing strategies

ii) Potential vulnerability to the firm if the vendor fails to perform the activity as contracted

iii) How to protect the firm from opportunistic bargaining by its vendor

iv) How outsourcing contracts should be structured to ensure reliability and quality

v) Level of competence to be retained for the purpose of monitoring external entities

By limiting or shedding activities that provide no strategic advantage, an organisation can increase the value it delivers both to customers and shareholders. It can lower costs and capital investments; so this is strategic and not a tactical step. Organisations that continue to make sourcing decisions based solely on cost will eventually die. Therefore organisations must combine strategic aspect with rigorous cost analysis (Fill, 2000).

4 Outsourcing of support services of healthcare in Malaysia

4.1 Background

The outsourcing (generally known as 'privatisation' in Malaysia and the term privatisation shall be used hereafter) of non-clinical services in Malaysia was first tested at the Kuala Lumpur General Hospital in the early 1990's. During that time, the functions privatised were security and laundry services. Due to the positive results, the Government had looked into the possibilities of implementing privatising at other major general and district hospitals. Since then, there has been an on-going debate within the nation on the fear of the increase in the cost of the public health services, as a result of privatisation.

The Government announced its intention to privatise health facilities and services in the Seventh Malaysia Plan. The Malaysia Plan is a comprehensive blueprint prepared by the Economic Planning Unit (EPU) of the Prime Minister's Department with approval by the Cabinet of Malaysia to allocate the national budget for every five (5) years in Malaysia. The Seventh Malaysia Plan covered the year 1996 until 2000 (Seventh Malaysia Plan, 1996).

In Malaysia, privatisation in the public health sector has so far taken the form of contracting out hospital support services, drug procurement and supply of various other non-medical services. In October 1996, the Ministry of Health announced its intention to privatise the non-clinical services, namely clinical waste management, hospital cleansing services, linen and laundry services, facility engineering maintenance services

and bio-medical engineering maintenance services. The RM7.6 billion (approximately €1.52 billion) deals were signed with three (3) companies for a 15-year concession for the privatisation of the above non-clinical services. This mega privatisation project involved 123 government hospitals and nine (9) health institutions (NST, 1996).

This privatisation strategy covering general, district and nucleus hospital was effectively undertaken in January 1997. The three companies involved were Faber Medi-Serve Sdn. Bhd. covering the northern zone of Peninsular Malaysia and the East Malaysia; Radicare (M) Sdn. Bhd. covers the southern zone of Peninsular Malaysia and Pantai Medivest Sdn. Bhd. covers the southern zone of Peninsular Malaysia. In addition, a company named Sistem Hospital Awasan Taraf Sdn. Bhd. (SIHAT) has been appointed to supervise the performance of these concession companies on behalf of the Ministry of Health. The privatisation project involved the Ministry of Health as the client organisation, the concession companies as the service providers, and SIHAT, a private company who supervise the concession companies' performance.

4.2 Decision Making Process

4.2.1 Privatisation Action Plan (PAP)

In 1983 the Government first announced its privatisation as its national policy. A Privatisation Action Plan (PAP) was formulated and represented a more systematic and organised manner of policy implementation. The PAP consisted of a two-year rolling plan which is reviewed at the end of each year. It detailed the entities to be privatised and those to be prepared for privatisation.

The formulation of the PAP has been guided by the Malaysian Privatisation Master Plan. Studies were undertaken by private consultants who reviewed a large numbers of Government-owned entities to determine their feasibility and desirability for privatisation. However, the Government will not necessarily accept all the projects proposed by the consultants. Careful consideration will be given to each of the entities before incorporating them into the PAP. The feasibility criterion is determined by two factors:-

Ease of privatisation – judged in terms of the requirement for restructuring to prepare for privatisation and the need for legal and regulatory changes.
Attractiveness to the private sector – determined by its competitive market position, growth potential and financial profile

4.2.2 Privatisation Grid

The desirability criterion is based on a sector analysis and is made in terms of the priority which the Government attaches to economic development and changes in that sector. The combination of the feasibility and the desirability criteria can be illustrated through a Privatisation Grid, as shown in Figure 1:-

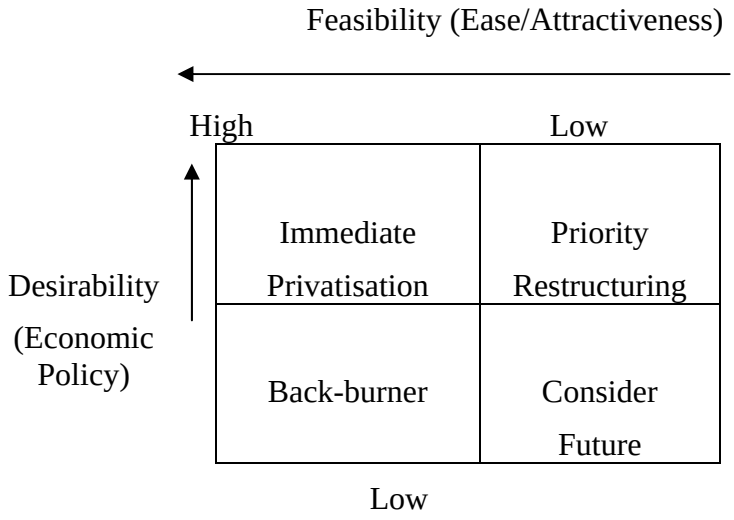

Figure 1. The Privatisation Grid

(Source: Privatisation Master Plan, Economic Planning Unit 1991)

The entities evaluated based on the feasibility and desirability criteria may be located in any of the four quadrants shown above. For 'immediate privatisation' are the entities which are ranked high for ease of privatisation and attractiveness to the private sector and also the Government's objective priority. Candidates which are ranked high in terms of the Government's objectives but are either difficult to be privatised or unattractive to the private sectors fall under 'priority restructuring'. This indicates that the candidates need to be restructured before they are privatised. The 'back-burner' includes candidates which are perfectly feasible to be privatised but the benefits of privatisation are less likely than the other candidates. Finally the 'consider future' are the candidates which are ranked poor in terms feasibility and desirability for privatisation. Therefore, they will remain in the public sector until they become attractive and important candidates for privatisation.

In addition to the Privatisation Grid, the impact which the project has on the economy is also taken into consideration in the formulation of the PAP. This derives form fairly large candidates that have potential to create changes and benefits to the economy due to the privatisation.

4.2.3 Approach to Privatisation

Both the Government and the private sector can initiate the privatisation of Government-owned entities.

Government Initiated

Under the Government initiated privatisation, offers will be made known to the public or certain target groups. The Economic Planning Unit, The Prime Minister's Department, will continuously review Government activities and identify candidates for privatisation. A programme will be drawn up for more in-depth studies and a two-year rolling PAP will be drawn up. This plan will be deliberated upon by the highest decision-making body at the official level regarding privatisation known as Inter-departmental Committee of Privatisation (ICP). The ICP will forward its

recommendations on the PAP to the Government for a decision. Upon approval, the ICP will evaluate the various possible modes of privatisation, namely sale of assets or equity, lease of assets, management contract (where in this study, the non-medical services are concerned) and Build-Operate-Transfer or Build-Operate. An award will be made by the Ministry. The responsible Ministry (in this case the Ministry of Health) will extend invitations to the private sector which will respond to such invitations by the Minister. The bids made by the private sector will be evaluated and thereafter an award will be granted by the Ministry.

Private initiated

The private sector is permitted to submit privatisation proposals to the Government, known as a comprehensive conceptual proposal. The potential for privatisation and the uniqueness of the proposal shall then be examined. If these criteria are met, a letter of exclusivity will be issued to the private provider concerned. The private provider shall undertake a feasibility study and submit the complete proposal to the Economic Planning Unit. Should the Government find it acceptable, negotiations will be carried out and an award made when both parties agree. In contrast, if the negotiations fail, the Government will privatise through competitive bidding as if it was a Government initiated project. However, the said private provider will be compensated for the cost for undertaking the study, which will be borne by the successful bidder.

5 Research Methodology

Existing studies on decision making of outsourcing were reviewed and limitations were identified. Literature review is a documentation of comprehensive review of the published work from secondary sources of data (Sekaran, 2006). By integrating insights drawn form the literature, the author proposes to undertake a pilot study via a questionnaire survey to several NHS Trusts. A pilot study is a small-scale replica and a rehearsal of the main study (Sekaran, 2006), sometimes known as a 'feasibility' studies. The purpose of the pilot study is to develop and test the adequacy of the research instruments and to assist in the development of the research questions and research plan. It is hoped that the responses and the outcome of the proposed pilot study will help to strengthen the direction of the research.

6 Conclusion and Further Research

Outsourcing, traditionally used by organisations as a short term strategy to reduce cost, has now attained strategic significance. However, outsourcing is not merely a fad and organisations have to be vigilant in identifying the core and non-core services within their activities. In addition, it is also imperative for the decision makers to decide the support services to be outsourced so that the benefits will be optimised. The Malaysian Government is the initiator for outsourcing non-clinical health services for the public healthcare in Malaysia. This was reflected in the Seventh Malaysia Plan 1996-2000. This 15-year privatisation strategy was in line with the Privatisation Action Plan (PAP) which consists of a two-year rolling plan, reviewed yearly. The next stage of the research is for the author to carry out a pilot study of UK practices. The target respondents are senior level persons involved in the decision making for the

procurement of support services in healthcare organisations. These people are likely to hold titles such as Director of Facilities, Director of Estates, and Director of Support Services etc. The data received from the pilot study is expected to demonstrate a diversity of practices, attitudes and behaviour patterns amongst the said respondents

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Adapting a Process Protocol Approach for Facilities Management in Higher Education Institutions in the United Kingdom

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Abstract:
This paper develops and describes the theoretical basis of a study of facilities management processes in UK higher education institutions. The study seeks to improve understanding of the relationship between FM processes and the changing context of HEIs. The research adopts a process protocol approach, first developed for construction processes, to help and promote a more strategic approach to FM to support objectives. The theoretical background to the study is drawn from the literature on facilities management processes. The study used a single, case study approach to investigate FM processes in a university organisation to gain in-depth information and insight of how FM Processes Protocol framework describes and map facilities management processes from the perspective of HEIs. The concept of FM processes protocol is introduced, and the process of its adaptation described. This deals with the way in which the Estate Division treats the current change using FM processes protocol approach. Mapping FM processes are limited to the top-down approach and considers facilities management processes at a strategic level only. The study reveals a better understanding of the adaptation of facilities management processes protocol within higher education institutions and is an importance contribution to management decision making.

Keywords:
Facilities management processes, facilities management process protocol, higher education institution, strategic facilities management

1 Introduction

The latest report by Universities United Kingdom (UUK) entitled 'The future size and shape of the higher education sector in the UK: threats and opportunities' identify potential opportunities and threats facing higher education institutions (HEIs) over the next 20 years. The higher education sector will faces challenge including a demographic downturn, competition from abroad, advances in learning technology and greater involvement of employers and private sector in the funding and delivery of higher education (Brown, Bekhradnia et al. 2008). Focus is more on perceived threats to the status quo than opportunities for positive change. HEIs need to react quickly to the

change pattern of student demand. HEIs must fully understand their organisation through modelling their processes to gain current snapshot of the organisation. FM organisations and department in HEIs need to well position to interface at this point to further support the organisation.

Organisation with a well defined management process can potentially improve decision making, stakeholder management, and consistency in delivery, organisational coordination and continuous improvement. There is no guidance or road maps for FM processes approach to be adopt in HEIs. University need a clear methodology of its FM processes in facing the fundamental change. This paper dealt with the developing and improvement of FM processes at a strategic level by adopting FM processes protocol approach. This paper is divided into four main sections. First, a literature review of FM processes and the adaptation of FM process protocol. Second, the research methodology consists of the selection of research strategy and the justification of the chosen single HEI case study in this research. Third, the background of the exploratory pilot study on higher education institution sector focusing at Estate Division, University of Salford as a case study. The last part of this paper dealt with the summary of findings of the processes being mapped and conclusion for further research. Through applying the facilities management process protocol, HEIs should be able to understand the importance of facilities management processes to their effectiveness and understand the need to assess the maturity of the existing processes. This will provides a basis for developing and improving the facilities management processes through a consistent, process based management approach.

2 Facilities Management Processes

The aim of the new European standard on FM processes is to provide guidance to facilities management organisations on the development and improvement of their processes to support the primary activities. This will support organisational development, innovation and improvement that will form a foundation for the further professionalisation of facilities management and its advancement in Europe (Alexander 2008). Research into FM processes can be classified into three main categories such as modelling and mapping, optimisation and improvement and FM processes applications. Several studies had revealed in FM process models that the strategic importance of facilities management, the need for increased awareness of the need to improve processes and for a framework for organisation and decision making (Weisinger 2006; Atkin and Bjork 2008; Sigg 2008). Previous work on reference process modelling within facility management also can be found in the literature (Redlein and Fleischmann 2006). Research on FM process mapping work focused on the development of FM process protocol approach (Fleming, Lee et al. 2008), the development of reference processes for internal control and use in IT applications (Redlein and Giller 2008) and the introduction of integrated best-practice process model (Buettner, Torben et al. 2008). Numerous studies have attempted to explain the application of FM processes and its relation to the organisation. Hinks (1998) investigated a conceptual framework for describing the relationship between the FM processes and FM IT, and a model for the dynamic mechanisms of their co-operation. The SPICE FM project is one of the example of process improvement which modified for FM to managing customer requirements, service planning and assessing facilities management process capabilities

in the health sector (Amaratunga, Sarshar et al. 2002). The other research in this healthcare sector is the OPIK research project which designs a step by step process for analysing FM processes. The standard processes have been designed for typical FM services to introduce professional facilities management methods in hospital (Lennerts, Able et al. 2003; Lennerts, Able et al. 2005; Lennerts, Abel et al. 2008). Svensson (1998) studied how to develop suitable information structures to support main processes of facilities management (FM). The approach chose to create these structures was to develop a generic FM process model and a building product model (Svensson 1998).

Redlein (2003) analysed the methods of modelling reference processes within facility management through a case studies of companies and suggested the use of the business process reengineering method for modelling FM processes. Hamid et al (2008) seek to understand the application of facilities management process in higher education institutions in the UK focusing on maintenance and operations in supporting the overall aims and objectives of the organisation (Hamid, Baldry et al. 2008a; Hamid, Baldry et al. 2008b). Similar to the background and context discussed in the introduction section, the literature review should flow from general to specific. There is no strict set of rules that prescribes the numbers of references that should be presented. However, as a rule of thumbs, every claims or important statement in the paper should be supported by at least one reference (can be academic or more industry related articles). References should be reasonably recent, key references and seminal works relevant to the field of study should be included.

2.1 Adapting a Process Protocol Approach for Facilities Management

The generic facilities management processes have been developed by researchers at University of Salford considering the FM definition in BS EN 15221-1:2006:5. The adoption of the generic FM processes protocol model into HEIs sectors, individual university organisations and projects can be approached as embedding new working practices. This thinking informed the design of the theoretical framework as shown in Figure 1.

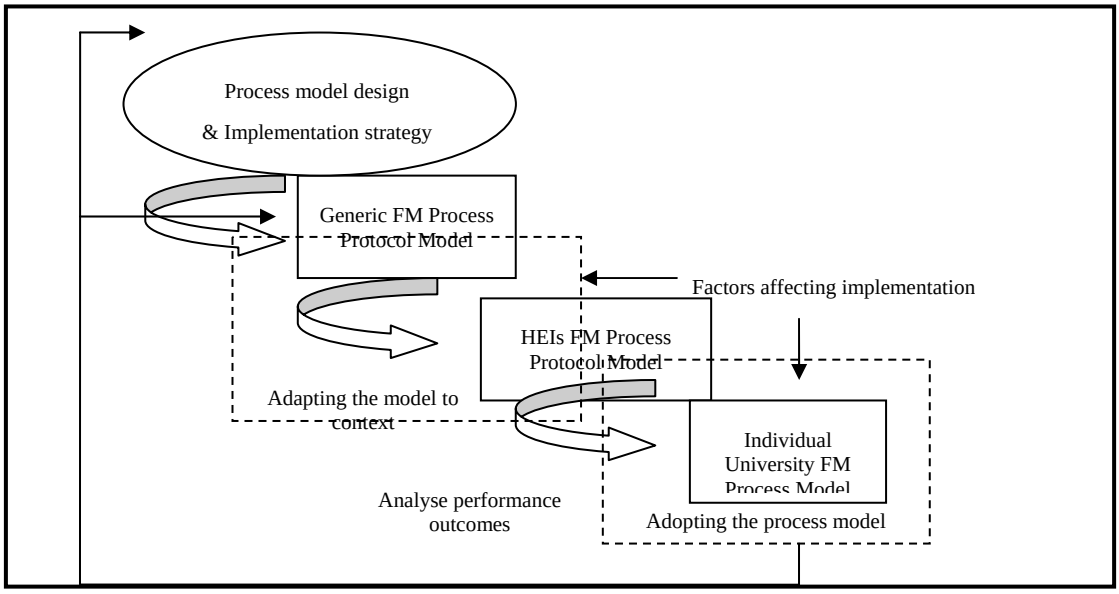

Figure 1. Generic FM process protocol implementation framework

This framework aims at providing a generic description of FM processes protocol models implementation within the sectors and individual organisations under the sectors. Examining the implementation of this processes model is one way to better understand how these models can improve the FM organisation in supporting the primary activities of the organisation. The high level activities in Figure 2 were initially grouped from a strategic, tactical and operational facilities management perspective into six stages that represent business cycles.

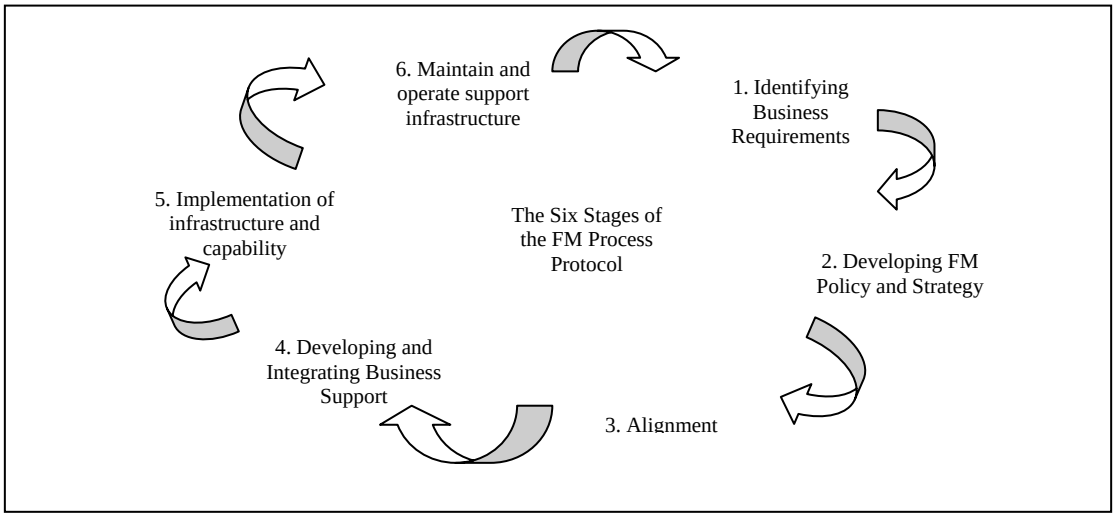

Figure 2. The Six Stages of the FM Process Protocol

Source: (Fleming, Lee et al. 2008)

Stage 1 - Identifying Business Requirement

This stage aims to provide guidance on how to achieve a thorough understanding of the client organisation (Fleming, Lee et al. 2008). The following element will be analysed:

Identify organisation primary processes and activities.

Reviews internal and external factors that may affect the organisation

Identify and review organisational strategy in terms of its aims, objectives, policies, mission, vision statement and value statement.

Define the primary and non primary business activities.

Identify and assess organisation stakeholder and their requirement according to their impact to the organisation.

Considered management, drivers, deliverables and critical issues.

Identify the support requirements of the primary business activities.

Core activities in HEIs are those relating to research, teaching and learning, and working with business and the community. The facilities of the institution includes a range of services, functions and activities, as well as buildings and equipment.

Stage 2 - Developing FM Policy and strategy

At this stage some degree of understanding should have been reached to determine FM policy and strategy. Responding to business needs require HEIs analysis and translation of business in top down process of business visioning and a bottom up process of understanding how work is getting done now and how the facility supports. Figure 3 below shows the gap need to be filled using strategic FM.

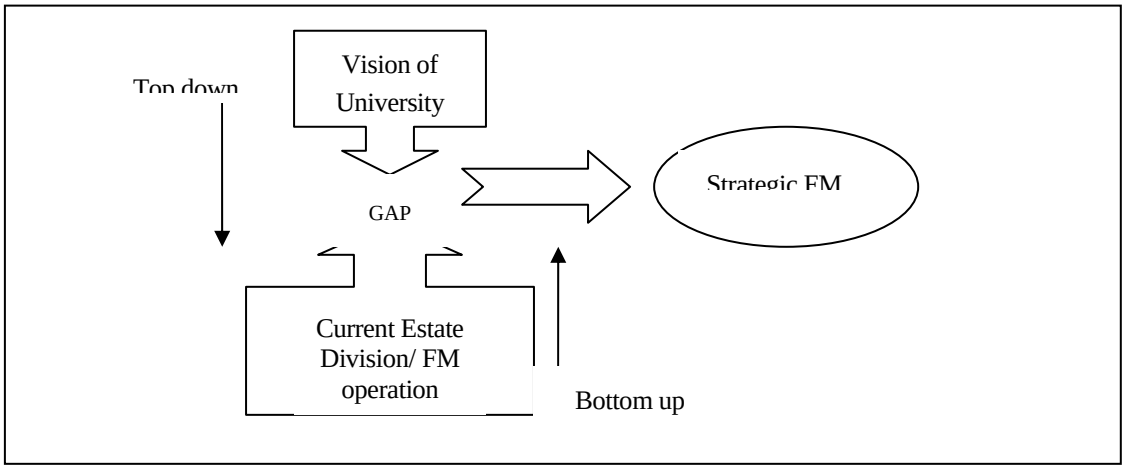

Figure 3. Strategic FM Gap

Stage 3 - Alignment Stages

This stage aligns the FM policy and strategy with the organisational requirements. The following support objectives are defined such as cost, space, optimisation, corporate social responsibility, portfolio management, business continuity, benefits management, performance and innovation.

Stage 4 – Developing and Integrating Business Support

This stage develops the support capability after the business identification and definition activity has occurred. The support capability can be developed based on the needs of the primary business activities and where appropriate it is integrated into the business infrastructure to provide dynamic seamless support.

Stage 5 - Implementation of support infrastructure and capability

The implementation of support infrastructure and capability consist of monitoring of project management, communication, performance management, stakeholder management, change management, customer relationship management and risk management.

Stage 6 - Maintain and operate support infrastructure

3 Research Methodology

The research strategy needed to support both the adaptation of FM process protocol and the understanding of its development within the HEIs. This strategy also needed to result in data repository sufficient to answer four research questions posed by the study:

What are the factors affecting the implementation of generic FM processes protocol approach within the higher education institutions?

What are the benefits of carrying out FM processes within a higher education institution?

How do individual university organisations implement this generic FM processes protocol approach?

How do strategic FM processes (focus on operation & maintenance) contribute in supporting university aim and objectives at a strategic level?

The researcher suggested that a qualitative research approach oriented towards discovery, description and holistic understanding of FM processes and activities was suitable for this research. Strauss and Corbin (1998) suggests that qualitative method can be used to obtains the intricate details about phenomenon such as feelings, thought process and emotions that are difficult to extract or learn about through more conventional research method. The study of the adaptation of facilities management processes protocol within higher education institutions required:

A flexible research design to allow the researcher to pursue new directions in data collection as understanding developed during the research. This study as an exploratory study required the flexibility to respond to the researcher's evolving understanding.

An orientation towards detail description that addresses both the context and specifics of the FM process protocol adoption.

A focus on the participants and the process through fieldwork activities. Fieldwork infers the researcher directs and personal contact with the people involved in a study.

A holistic orientation to address the complex of activities, processes, triggers and their interrelationships

The researcher believes that the case study as a research strategy is well-suited to capturing the knowledge of FM practitioners and developing theories from it. Stake (1995) suggests that a case study is useful when opportunity to learn is of primary importance. Yin (2003) characterizes case study as empirical inquiry that:

Investigate a contemporary phenomena within its real life context, especially when

The boundaries between phenomenon and context are not clearly evident and

Which multiple source of evidence are used

Considering (Yin 2003), applying the exploratory phase of investigation is considered appropriate in this research. A single-case design uses a single case study to address the research questions. By choosing single case study it will allow the researcher involved in-depth analysis of the case studies (Creswell 1998; Robson 2002). Yin (2003) suggested five rationales to use a single-case study such as:

1. It represents the critical case in testing a well-formulated theory whereby the case meets all the conditions for testing the theory thoroughly.

2. It represents an extreme or unique case such as a case with a rare disorder.

3. It is the representative or typical case where the case study may represent a typical project among many different projects, i.e., informs about common situations/experiences.

4. The case is revelatory case and the researcher has an unique opportunity to study something previously inaccessible to observation. This will opens a new topic for exploration.

5. The case is longitudinal case – studying the same single case at two or more different points of time.

By choosing single-case design, the researcher needs to prepare to make an extremely strong argument justifying the choice for the case. Single-case studies are often criticized due to fears about uniqueness surrounding the case. Criticisms may turn to scepticism about the researcher ability to do empirical work beyond a single-case study. A major limitation of a single case study is lack of statistical generalization however this study did not have a goal of generalization but one of understanding a complex phenomenon.

3.1 Pilot case study

The case study chosen concerns with the fundamental changes faced by the university. Since 1990's the University carried out a major change in its corporate policy to move from its position as a teaching university to an internationally excellent enterprise university led institution while maintaining its teaching programmes and reputation. Considered as Mode 2 university, the university strengthens its research and collaborate with industry and government where application (intellectual, economic and social interest) as the main objectives. University's mission, set out in the Strategic Framework 2005-2015, is to be an enterprising University, achieving internationally recognised excellence in education for capability, research for the real world and partnership with business and the community. In 2006, Realising Our Vision (ROV) for the university was introduced with the aim to be nationally and internationally recognised excellence in teaching, learning research and enterprise (ROV 2007). Four domain of change include governance, strategic leadership, academic management and professional service. This fundamental shift in policy led to the re-engineering of the University's academic strategy, organisational structure, working and teaching patterns, involving the decentralization of academic management functions to individual faculties and the centralization of administrative support services generally. To become an 'entrepreneur-led' university, the University was more concerned with the issues of physical resource

support including campus environment, the condition and appearance of facilities, and number of the shared academic facilities. The reengineering led to an imbalance between the capacity and capabilities of the existing Estate and Property Service Division, its strategic and operational responsibilities. The FM arrangements need to introduced and restructured to support new organisational policy and management structure and to adjust FM strategic supports and operational capabilities. The changes were carried out through a consolidation of facility services and operations, an expansion to its scope of service and responsibility, restructuring the FM organisation, raising the level of FM involvement in the University's management systems, the adoption of more outsourcing arrangements and the establishment of a system for FM accountability. The changes will improve the operational capabilities of the Property and Services division to handle the increased complexity of facility operations and the strategic capabilities of FM to support the longer-term objectives of the University. The primary functions of Property and Services division should be shifted to more administrative management, planning and programming, with main responsibilities were largely changed to service administration, space planning and management and service programming instead of building operations, service and maintenance.

Its priorities were given to the issues of resource availability, facility operating cost performance, public and community support, and health and safety.

4 Findings and Discussion

The following outlines the key processes which University manage to define and shape the service provided to the organisation. Four key processes have been identified and map. The maps demonstrate a logical flow of connecting activities & functions which define how University of Salford defines what it needs to do and how well it does it. The maps are not intended to reflect the 'as is' situation rather how an ideal 'to be' structure would be constructed. The purpose of this map is to help the researcher thinking, identify gaps in existing functionality of the university strategy decision making and focus on operation and maintenance of the Estate and Property Services division. It will help simplify greater clarity in terms of 'to be' FM processes design. Table 1 below shows the summary of processes been mapped.

Table 1 – University of Salford 4 key processes

Ref	Process Name	Process Description
P1	UoS Strategy & Planning	The creation of a comprehensive strategic plan which defines the direction and priorities for the university
P2	UoS Estate Strategy	The creation of a comprehensive estate strategy which defines the direction of the division in supporting the mission and objective of the university
P3	Estate Decision Making Processes	Consist of decision making processes of the university for estate matters
P4	Operation & Maintenance Processes	The provision of operation and maintenance services to university in line with defined standards & costs. Service may be provided directly, contracted via a third party or a combination

The initial reviews show the lack at strategic and tactical dimension to maximise the contribution support services make to the university core business i.e., key support function (estate infrastructure) with resource and services activities (building maintenance). The estate strategy and building maintenance processes mapped in P2 and P4 clearly showed the processes started at the tactical and operational level of FM rather than at the more strategic level. There is a need to align the work of support services more closely to the core academic business of the university to ensure its contribution more effectively to the university future success. Strategy is used to bridge the gap between where the university is and where they want or need to be. Facilities are a tool for HEIs organisation and HEIs strategy needs facilities management strategy to accomplish its vision. How would FM support and contribute to decision making processes if FM itself does not exist in the division? The way the Estate and Property Services division UoS, managed and operated could be considered the old way of FM such as:

Asset driven and quantitative – lead to the risk of failing to align with the university need.

Gathered data from each department independently, compiled, processes, transformed into quantitative summary identifying real estate or space needs forecast.

Respond to priorities and internal politics. (FM is not about responsive, it should be lead and more proactively at strategic level)

Based on Estate Department Quinquennial review of the university in 2003 there is no relation with the decision making of the university with Estate Division. Some of the decision flow without involving Estate representative. It is more directive approach rather than participatory approach.

The Division is more towards strategic asset management rather than strategic facilities management where FM strategic does not occurred at the organisation strategic level.

Lack of FM capability and a forward looking strategic view i.e. Developing Estate Strategy and Operation and Maintenance processes.

5 Conclusion and Further Research

The new way of FM is to working toward vision where customer driver choice and lead rather than follower in the organisation and added value to the organisation. The university can applies the rational systematically to identify clearly how services may contribute to the organisation success. There is a need to the university to develop a long term FM strategy aligned with the overall business strategy through develop processes for facilities management. Streamline decision making processes with collaboration and knowledge sharing will help the estate department in envision the future of using facilities to meet the accelerate university change. With the new professional service structure of the university it will give the ability for Estate Division to influence major decision before they are made since the Director of the division sits within the Strategic Leadership Team. The proposed adoption of FM processes protocol is one way to addresses the need of understanding processes approach in the university.

Further work is scheduled to conduct an interview with the identified key personnel of the University of Salford to clarify and verify the process. It will help simplify greater clarity in terms of ‘to be’ FM processes design and complete the adoption of the six stages of the FM Process Protocol.

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Accounting for knowledge embedded in physical objects and environments: The role of artefacts in transferring knowledge

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Abstract:
The intention to investigate the role of artefacts (objects and environments) in codifying, embedding and disseminating knowledge was inspired by an awareness that organisations across all sectors are increasingly being asked not only to provide products in the first instance, but also to support them throughout their service life. Thus a move from product-delivery to product-service designs is suggested. This paper considers ways in which knowledge can be embedded into the physical properties of artefacts and how this can consequently aid the dissemination and management of knowledge in and across stages of life cycles. A literature review and fieldwork based on an ethnomethodological approach are used to investigate this topic. Accounts of the situated meaning of artefacts within social processes are obtained using ethnographic armchair research. Unique adequacy is used to achieve an understanding of how people make sense of artefacts. The initial findings of the current research show that knowledge can be embedded or encoded into the physical properties of artefacts and that this can be successfully transferred from artefact to user.

Keywords:
ethnomethodology; artefacts; unique adequacy; knowledge management; embedded

1 Introduction

The intention to investigate the role of artefacts (objects and environments) in codifying, embedding and disseminating knowledge has been inspired by the objectives of the Knowledge and Information Management (KIM) Grand Challenge Project. The project recognizes that, 'in response to customers' changing needs, organizations across all sectors are increasingly being asked not only to provide products in the first instance, but also to support them throughout their service life' (KIM 2006). Thus a move from product-delivery to product-service designs is suggested. KIM emphasizes the need to consider ways in which knowledge can be preserved in practices, records and artefacts, in order to support service throughout the life cycle of a product. The broad aim of this research is to investigate how knowledge can be preserved in artefacts and how this

consequently aids its dissemination and management in and across stages of life cycles of products.

This paper looks at the role of artefacts within social practices and at how codified and embedded knowledge can be communicated from artefact to user. In the context of this paper codified knowledge refers to written knowledge or that which is encoded in signs, for example, a piece of paper bearing a programme of events or sign showing by way of an arrow whether one should turn left or right (Collins 1993). Embedded knowledge on the other hand refers to knowledge which is built into the physical properties of artefacts for the purpose of aiding the transfer of knowledge from artefact to user. An example of this is how people are able to tell the direction a door should open without the need to rely on written instructions or signs. However, it ought to be pointed out at this early stage that the use of the term embedded knowledge in this context is yet to be acknowledged. In generally the term is commonly used in the field of design to refer to knowledge which is linked with tools and practices rather than explicitly codified or represented (Collins, 1993). For example, an information system may have knowledge embedded into its design. In knowledge management, a distinction is drawn between knowledge and information (Davenport and Prusak, 1998). There is a picture of codified information as artefact on the one hand and practice as knowledge on the other. In this paper the limitations of this approach are highlighted with a view to suggesting a third concept that extends and complements it. The third concept is that of artefacts as bearers of knowledge or information. Thus, the role of objects and environments in codifying, embedding and disseminating knowledge within the context of social processes is explored.

This research which is in its early stages has partly achieved its aims through a review of literature and some fieldwork. The initial findings indicate that knowledge can be embedded in the physical properties of artefacts in such a way that communication is made explicit between artefact and user.

An ethnomethodological approach is used to produce uniquely adequate (UA) accounts of the situated meaning of artefacts within social processes (Rooke and Kagioglou 2007). This approach primarily adopts auto-ethnographic (Hockey and Collinson, 2006) and 'armchair' research (Francis and Hester 2004) techniques. Other techniques include ethnographic interviews, participant observation, direct observation and the analysis of documents and photographs of artefacts.

The first part of the paper briefly looks at the meaning of key terms; knowledge and knowledge management. The second part is a research report which starts by highlighting the value of the physical properties of artefacts and ends with a look at empirical findings from the researcher’s auto-ethnography research. An analysis of photographs of artefacts is offered in this section. The main parts of the paper are followed by the standard sections on research methodology, findings and discussions, conclusion and further research and acknowledgements.

2 What is Knowledge?

Investigating the role played by artefacts in the codification, embedding and dissemination of knowledge within social processes cannot be achieved without first paying attention to the meaning of the key concepts: knowledge and knowledge management. As the move from product-delivery to product-service (KIM 2006) gains speed, the need to manage the flow of knowledge throughout the service life of a product cannot be ignored. This suggests a need, on the part of designers or manufacturers, to embed or encode in artefacts the kind of knowledge that will make its flow from artefact to user smooth. McInerney (2002), suggests that 'an understanding of knowledge itself is key to effective knowledge management' (p.1). A quick search for the meaning of the word knowledge reveals that defining the concept is not a straight forward exercise. This is evident in the three definitions highlighted below;

In the Merriam Webster's Collegiate Dictionary (2002), it is defined as;
'...an acquaintance with or an understanding of a science, art or technique'
The Oxford English Dictionary defines it as;
'... acknowledging... recognizing... inquiring... being aware... understanding... cognizance... intelligence... information acquired through study, and learning'
McInerney (2002) defines knowledge as;
'...an awareness of what one knows through study, reasoning, experience or association or through various types of learning'
The meaning of knowledge also appears to be the subject of on-going disputes amongst philosophers. Davenport and Prusak (1998) describe this obsession as a lifetime occupation for some philosophers where they say '...epistemologists spend their lives trying to understand what it means to know something' (p. 5). They contend that rather than pretend that there is a definitive answer to what knowledge is it is better to look for '...a working definition, a pragmatic description that helps us communicate what we mean...' (p.5). This paper chooses to endorse this contention because it is believed that there is a danger of limiting one's understanding of what it means to know something when one chooses to belong to one camp. A much broader approach to the understanding of knowledge such as that advocated by McInerney's (2002) and Davenport and Prusak (1998) is suggested. The former describes knowledge as a product of a varied set of processes which are constantly changing with human experience. In fact, from her definition of knowledge, it is clear that she makes an attempt to incorporate what can be argued to be important aspects of various theories of knowledge. McInerney's views, as will be seen later, are representative of the general views held within the discipline of knowledge management (KM) in particular those of Davenport and Prusak (1998). The next section reviews some of the thinking within the discipline of KM paying particular attention to the way knowledge is understood within this context.

3 Knowledge Management

Keane and Mason (2006) observe that the discipline of KM has continued to receive the attention of both researchers and practitioners since its establishment in the mid 1990s. Its goal has generally been viewed as the application of technical and organizational capabilities to improve the processes of creating, storing, retrieving, transferring, and

applying knowledge and greater a greater emphasis has been placed on the management of knowledge and the development of the channels through which knowledge and information flow, they note. Wilson (2002), however, finds that there is a broad range of thought on KM with no unanimous definition. He notes that as the discipline continues to gain recognition there appears to be an increasing presence of academic disputes within epistemology emerging in both the theory and practice of knowledge management. A comparison of these disputes with those identified earlier would be an interesting exercise. For example, it would be interesting to see if earlier epistemological debates have in any way influenced the way knowledge is understood within the context of KM. Unfortunately, such an exercise is beyond the scope of this paper. However, a brief review of some criticisms of the most popular school of thought is worthwhile. This should help pave the way for the discussion of the role played by artefacts in the transfer of knowledge from artefact to user.

The prominent school of thought on KM is that associated with the work of Davenport and Prusak (1998) and that of Nonaka and Takeuchi (1995). According to Keane and Mason (2006) this school of thought makes two assumptions. The first is that within KM there are two types of knowledge (tacit and explicit) and that knowledge management systems should focus on converting one type to the other. The second assumption is that there is an important distinction between knowledge and information. Their persuasive arguments as to why these two popular assumptions need revisiting are, unfortunately beyond the scope of this paper. It is, however, useful to point out that Nonaka and Takeuchi (1995) are implicated for holding that a successful KM program needs to convert internalized tacit knowledge into explicit codified knowledge in order to share it. To think this way, assert Keane and Mason (2006) is to suggest that for knowledge to be made explicit, it must be translated into information. This, oversimplification, they contend has resulted in the misconception that tacit and explicit are types rather than dimensions of knowledge. As with the second assumption, that there is an important distinction between information and knowledge and that the latter is at the top of the hierarchy (Tuomi 2000, Von Krogh,, Ichijo, and Nonaka 2000, Wilson 2002 and Davenport and Prusak, 1998), they caution that focussing on one as more or less superior to the other negatively impacts on the effort to manage knowledge.

This paper also finds problems with the distinction between information and knowledge. It is observed that this distinction is the outcome of the confusion between the two concepts. The definitions of terms by Davenport and Prusak's (1998) below offer grounds for criticism.

‘...information should be thought of as “data that makes a difference” (p3),...“data endowed with relevance and purpose” (p2),... to inform' originally meant 'to give shape to' ...Data is “a set of [sic] discrete, objective facts about events”(p2)...and that

Knowledge, on the other hand, is much richer, it is:

“a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it

often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms." (p5)'

In critiquing the above, it is acknowledged that the definitions of data and information are technical definitions used in computer technology and as such can be viewed as unproblematic in this context. However, a cursory examination of the philosophical grammar (Wittgenstein, 1974) of the three terms demonstrates that several aspects of their more general usage present possible obstacles and pitfalls in the way of further development. First, data are not necessarily only facts about events; they may be facts about objects or substances, such as the composition or physical properties of a particular steel girder, or concrete mix. They may also relate to spatial properties. Secondly, 'what is given' is not necessarily a discrete fact at all. It could, for instance, be a picture, a sound, or a feeling. A sounder definition of data therefore would be recorded information (given that it would have to have been seen to have some relevance to have been recorded in the first place)

Furthermore, while it is extremely useful to think of information as shaped data, it can also be misleading, if it is assumed that that is all information can be. Phenomenologists have pointed out that people not only shape facts in this manner, but give shape to the whole of the world we live in. Indeed, facts themselves are a product of the social processes by which people make sense of the world. In the real world of organisations, if one asks a colleague for information regarding a task they are about to perform, s/he is as likely to produce advice by drawing upon their experience, as upon any facts they themselves have been given. Davenport and Prusak (1998) implicitly recognise this when they refer to "contextual information" (p.5) in their definition of knowledge, but this leads them to a uni-directional characterisation of the grammar, such that "knowledge derives from information as information derives from data" (p.6). It might just as be said that data (facts) derive from knowledge (experience and thought) and thus, so too does information. It might also be said that sometimes information derives directly from experience, without the intervening process of producing facts. Further, information can be passed directly from one human being and another without being recorded as data.

Information is knowledge, but knowledge is not necessarily information. To explain this asymmetry of meaning, Ryle's (1963) distinction between knowing how and knowing that is adopted. To know how is to be able to do something, it is thus essential to a practice. The community of practice conception serves to highlight this second, important aspect of knowledge. Furthermore, it usefully stresses the social nature of this practice knowledge (Wenger, 1999). The conception of knowledge as social practice is particularly useful as the test for knowledge is always performative. Central to the KIM project "lies the contested distinction between knowledge and information" (KIM 2006). Davenport and Prusak's (1998) characterisation of knowledge as a process, rather than an artefact is adopted to provide a basis for working definitions. Thus, KIM addresses two major aspects of the knowledge and information management problem as it occurs in the move towards a product-service paradigm.

In an effort to clarify the confusion in the way knowledge is understood within KM a tri-partite approach to knowledge is offered. The tri-partite approach to knowledge is suggested by an apparent deficiency in the information/community of practice

distinction used to formulate the KIM problematic. The suggested approach supplements the information and community of practice concepts with a conception of physical objects and environments as information carrying entities which are constituted, recognised and used in the course of social practices. The tri-partite approach highlights the value of physical (including visual and tactile) properties of artefacts in the transfer of knowledge from artefact to user. The next part considers this third aspect of knowledge in detail. The aim is to establish that physical objects and environments have an important role to play in codifying, embedding and disseminating knowledge. Thus, the physical (including visual and tactile) properties of artefacts as bearers of knowledge are emphasised.

4 Researching Knowledge Embedded in the Physical Properties of Artefacts

Physical properties of artefacts have always been utilised to store information. Computer databases are simply a particularly sophisticated and useful example of this. In production and operations management, attention has been given to the rendering of information in visual form and providing transparency to the work situation (Galsworth 1997; Hines, Francis & Found 2005), especially stimulated by the example of the Toyota Production System. Generally, it can be assumed that lack of transparency increases the propensity to err, reduces the visibility of errors, and diminishes motivation for improvement (Formoso et al 2002). Communication through the visual properties of artefacts has recently received attention also in a number of other fields. The kanban system uses physical placement of documents to facilitate improved production flow (Shingo 1988). Poka yoke (mistake proofing) involves the physical embodiment of assembly and operation knowledge in components and products. In aerospace, Dekker (2005) observes how the physical conditions and configurations of 'normal work' can contribute to an unnoticed drift towards system failure.

This research has recently analysed photographs of objects and environments to determine the nature in which knowledge is codified and embedded in them and how this knowledge is consequently disseminated. Codified knowledge in this context refers to information that is conveyed in signs and symbols (Collins, 1993) and embedded knowledge that which embedded in the physical properties of artefacts. The next section looks at some of the photographs showing examples of each kind of knowledge. All the photographs used have been taken by the researcher herself.

5 Codifying, embedding and disseminating knowledge

This section looks at some of the work the researcher has started to analyse. The examples chosen are a reflection on her own experience as a nurse, a patient and an ordinary member of the public. The first example is an account of how the researcher made sense of the hospital environment in order to find her way to the x-ray department. The second example illustrates how people can intuitively open a door without a struggle. The last example is an account of a breakdown in the transfer of knowledge in the maintenance of an oxygen gas cylinder. All the photographs used in this paper have been taken by the researcher herself. The research is intended to meet

the criteria of the unique adequacy requirement, which is briefly described under the methodology section.

5.1 A visit to the x-ray department

This is a true account of the researcher's own experience as a patient in finding her way to the x-ray department from home. She will be referred to as Mrs R in this section. The letter inviting Mrs R for an appointment did not give much direction on how to find the way to the x-ray department. All it said was that the department was in the purple zone. As a result, she had to depend on the physical properties of artefacts plus information posted on signs to find her way in and around the hospital. Below is an account of how she managed to find her way from the time she got off the bus outside the hospital.

As she got off the bus she saw an opening into the hospital grounds a few yards from the bus stop. This happened to be the only obvious opening so she assumed that it was the entrance she needed. Barely a few yards into the hospital grounds Mrs R was presented with the sign stating:

Unfortunately there was no further information to help Mrs R gain access to the main hospital. On exploring further, she soon found herself walking along an alley way with no clues as to where the entrance to the main hospital was. At the end of the alley she was suddenly in full view of the entrance to the hospital. It was clearly marked with colour coded signs one of which showed the direction to the purple zone. A few yards into the hospital corridor, she found yet another display of signs directing the user to various hospital departments. The directions for the x-ray department were on it.

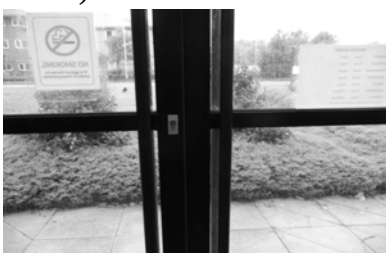
Further in, she was presented with more signs of this nature, some hanging from a height and others stuck on the walls. The confusion occurred at a junction where the sign for the x-ray department pointed upwards. Mrs R automatically assumed that she was to take a lift to the floor above. However, the sign is intended to instruct the user to go forward. Unfortunately, it was not easy to find the way forward at this particular junction of the hospital because of curves, alcoves and corners. Three other people

appeared to be struggling to find their way too. A hospital porter spontaneously offered to help, stating; 'Its double Dutch here'

This example clearly shows that Mrs R used codified knowledge to find her way in and around the hospital. It is also clear that this kind of knowledge alone was not entirely effective in helping her find her way. Wayfinding specialists contend that putting up signs without strategy in complex environments sometimes has the opposite effect to that intended (Inside Information Ltd, 2008). This was certainly true in this case. The researcher intends to establish that complex environments such as hospitals can be embedded with knowledge which should make the task of finding one's way in and around the hospital an easy and pleasant one with minimum need for signs. Further analysis of Mrs R's experience, therefore, will seek to identify features that can be designed into or out of the two specific points where wayfinding became problematic for Mrs R. The first breakdown can be seen right at the beginning where there is no clear access to the main hospital. The second is at the junction where the instruction given by the sign pointing upwards is not supported by the architectural layout of that part of the building.

6.2 Opening a door

Think of the simple task of opening a door. How often do we try to open doors the wrong way even where there are clear instructions saying “Push or Pull”? Is it not also true that we feel stupid for having failed to see the written signs? Quite often people have chided themselves (silly me!) for having failed to spot the instruction giving signs. However, according to Norman (2002), well designed artefacts should be easy to interpret and understand. They should contain visible clues as to how they should be operated without the need for words or symbols and certainly without any need for trial and error (Norman, 2002). In the case of knowing how to operate a door, Norman



contends that the correct parts should not only be visible but must convey the correct message. The designer must provide signals that naturally communicate to the user where to push or pull.

A door with a vertical plate on one side and a handle on the other immediately communicates to the user the direction in which the door will open (see photographs below). This is a good example of how knowledge can be embedded in artefacts at design stage. The door is clearly instructing its user on how to perform the task without the need for explicit communication. The user performs the task without the need for trial and error. He or she is able to make sense of how to open the door without having to pay much attention to the task at hand.

Norman assures us that

'The human mind is exquisitely tailored to make sense of the world. Give it the slightest clue and off it goes, providing explanation, rationalization, understanding' (p.2).

5.3 The Oxygen Cylinder

Healthcare institutions have an obligation to provide an effective resuscitation service and to ensure that their members of staff receive training and regular updates for maintaining a level of competence appropriate for them to resuscitate a patient in the event of a cardiac failure (Royal College of Anaesthetists et al 2004). It is the job of healthcare professionals to ensure that there is adequate oxygen in the cylinder and that it is not out of date. On a regular basis therefore, the cylinder must be checked for fullness and freshness. A replacement is necessary only when the oxygen is out of date or when the cylinder is less than half full. A label carrying the expiry date is attached to the cylinder by the manufacturer (see below). The life cycle of oxygen cylinders varies by manufacturer from 5-15 years.

In the incident involving the oxygen cylinder, a conscientious student nurse alerted the team to the fact that the cylinder was a year out of date. Here the researcher is interested in finding practical solutions to this breakdown in the flow of knowledge. Can this device be embedded with knowledge which should make it possible for nurses to know shortly before the long life span comes to an end? If so, what kind of knowledge can be embedded?

6 Research Methodology

The current research adopts an ethnomethodological approach to investigating how people make sense of knowledge embedded in the physical properties of artefacts. Ethnomethodology is a sociological approach distinct from traditional sociological approaches in that it concerns itself solely with observable features of social life

(Francis and Hester, 2004). It focuses on how observable social activities are produced, accomplished and understood by ordinary members of society. Put in a different way, it is keen to investigate how members of society (individuals and organisations) make sense of and function in society by creating social facts or understandings of how society works. Thus, to understand how one finds their way to the x-ray department, the researcher must know what any member to that setting would ordinarily know about that setting. The researcher is able to perform relevant activities within that setting without censure from other members. Meeting this criterion satisfies the weak requirement of the unique adequacy (UA) criteria which stipulates that:

"the analyst must be vulgarly competent in the local production and reflexively natural accountability of the phenomenon" (Garfinkel and Wieder 1992, p182)

By contrast, the strong requirement concerns the reporting of research (Rooke and Kagioglou, 2007). It demands that the methods of analysis used to report on, or describe a setting should be derived from that setting, that is to say, they should originate from the setting they describe (Rooke et al, 1997). In effect, UA stipulates the application of a policy of 'ethnomethodological indifference': a refusal to evaluate, describe or explain the activities that constitute the setting using criteria, concepts or theories that are not a part of that setting. This approach is chosen because it provides a framework for researching and analysing how people make sense of artefacts without relying on previous theories.

7 Findings and Discussion

The first part of this paper has reviewed various views held on the meaning of the concepts knowledge and knowledge management. The aim was to gain a clearer understanding of these key concepts in order to pave the way for the discussion of the important role played by artefacts in the transfer of knowledge throughout the life cycle of a product. The review has uncovered much dispute amongst philosophers, practitioners and researchers regarding both concepts. However, the position of this paper is that it is more important to pay attention to the practical pockets of advice suggested in these various disputes rather than to enter into them. For example, it is contended that in order to reduce the risk of limiting one's understanding of the meaning of knowledge, especially within KM, it would be more productive to see it as a product of a varied set of processes which are constantly changing with human experience. The review has also highlighted arguments to the effect that the distinctions between tacit/explicit and information/knowledge are faulty and misleading. A need for revisiting these distinctions is suggested, as these issues are at the core of KM and are said to be used wrongly to inform current KM programmes (Keane and Mason, 2006). In the case of the information/knowledge dichotomy, an alternative approach (tri-partite) to the understanding of knowledge within KM is suggested. The second half of the paper is an attempt to develop the third concept of the tri-partite approach to knowledge. The review shows that there is a small body of evidence in literature highlighting the value of the physical properties of artefacts in transferring knowledge within social processes. The initial findings of the current research show examples where artefacts successfully disseminate knowledge embedded or encoded in them. An example where there is a breakdown in the transfer of knowledge is also highlighted.

8 Conclusion and Further Research

The original intention of this paper was to investigate the role played by physical objects and environments in communicating knowledge to their users. This was inspired by the objectives of the KIM Grand project which recognises that more and more customers are increasingly demanding from manufacturers' products that can be supported throughout their life cycle. Thus organisations across all sectors need to move from product-delivery designs to product-service ones. This, therefore, calls for a further need to find best ways of communicating with users through artefacts. These ways should make it easy for customers to operate artefacts or within them without the need to run back to the producer every time a breakdown occurs. This research, therefore, suggests that embedding knowledge into artefacts in such a way that the intended knowledge is explicitly communicated to users is one way of ensuring that an artefact is supported throughout its life cycle. Doing so will require an understanding of what knowledge is and how it can be managed in the first instance.

The first half of the paper has shown that the two key concepts of knowledge and knowledge management continue to be debated amongst philosophers, KM practitioners and researchers regarding their scope and meaning. The review has uncovered several calls for a clearer understanding of and approach to these concepts. For example, Davenport and Prusak (1998) call for a working definition of what it means to know something on realising that disputing amongst philosophers has no end in sight. There is also a call by Keane and Mason (2006) for the unification of the broad range of thought on KM and a reconsideration of the current distinctions drawn between tacit/explicit and information/knowledge within this discipline. This paper calls for broader understanding and clarification of knowledge, information and data within KM. A tri-partite approach to knowledge is suggested as the solution to the confusion that there is in the way these three concepts are understood. The approach sees information, practice and artefacts as knowledge bearing entities and key to its effective transfer. The second half of the paper puts forward the early stages of the move towards developing the third concept of the tri-partite approach. It has shown that researching how knowledge can be codified or embedded in artefacts with a view to aiding explicit communication between user and artefact is currently under way. The earliest findings based on the researcher's own experience and an analysis of photographs of artefacts are beginning to show that knowledge can be embedded and encoded in the physical properties of artefacts in such a way that it can be explicitly communicated from artefact to user.

The issues highlighted in this paper suggest further work. The call for a reconsideration of the popular assumptions should not be ignored. Future work intends to look more closely at the philosophical arguments around tacit and explicit knowledge. The next level of fieldwork is a research opportunity in a hospital setting. The researcher is currently investigating how staff, patients and visitors make use of knowledge embedded in physical objects and environments to find their way to, in and around hospital (Wayfinding). Future work intends to investigate how patients and staff use embedded knowledge to make sense of various hospital rooms (treatment rooms, toilets, etc.); enhance their hospital experience during a treatment episode (Patient care pathways); and maintain the hospital built environment and technical devices that are part of it.

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Impact of Organizational Competencies on Construction Project Performance

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Abstract:
Measuring performance in terms of tangible factors (e.g. financial measures) has diverted to the usage of intangible measures during the last few decades. Within the context of this study, interdependencies between a construction company's competencies with "project performance" were investigated from a resource based perspective which requires intangible assets of a company. To achieve the objective, a questionnaire survey was administered to 73 Turkish contractors and the data obtained from 350 projects were analysed using structural equation modelling (SEM). The findings of the research indicated that, "project performance" is influenced by organizational competencies such as "strategies and resources" and "strength of relationships with other parties" as well as its "project management competencies".

Keywords:
Project performance, organizational competencies, project management competencies, strategies and resources, strength of relationships

1 Introduction

Performance measurement is an important process that quantifies the efficiency and effectiveness of all actions in every business (Amaratunga et al., 2000). Therefore, it is an essential ingredient in achieving objectives (Evangelidizs, 1983). Companies, primarily in manufacturing industries, started measuring their performance in order to predict the conditions in the business environment in which they compete and to set their future strategies (Neely, 1999). The driving force for performance measurement gained momentum owing to the requirements of clients, investors and other stakeholders (Robinson et al., 2005). The increased popularity of performance measurement pioneered also the investigation of qualitative measures in contrast to the traditional measures which were expressed in financial terms (Kaplan and Norton, 1992). As a result, a new field of study emerged in which researchers started to search for different measurement parameters and assess their impact on performance.

During the last few decades, a metamorphosis in business perceptions of construction industry was also inevitable. A general decline was observed in the performance of construction companies and all recommendations were stressing the fact that, determination of performance measures was essential for the rehabilitation of the industry. Companies needed to know their status in the industry, what they had to improve and how to influence their subordinate's behaviour. As the level of competition between companies increased and the need for the rehabilitation of the industry occurred, measuring performance became a fertile research area also in construction management literature (Kagioglou et al., 2001; Bassioni et al., 2004).

This study reviews and discusses the effect of organizational competencies on project performance. Project performance is assumed to be affected by organizational competencies such as the strategies and resources and the strength of relationships with other parties in a project environment as well as the project management competencies. From this point of view, project performance is being discussed by different aspects of a project environment including not tangible but intangible assets. For the purpose of the study, a questionnaire survey was administered through construction companies in Turkey and 73 responses with data from 350 projects were received. Structural equation modelling (SEM) technique was used to analyse the relevancy of the factors for measuring project performance and verify the pre-assumed relationships between the performance measures.

2 Definition, Classification and Interaction of the Variables

A variety of different projects constitute the structure of the construction industry. Despite the fact that a similar set of processes are performed, each project is unique and considered as a prototype. Thus, it can be inferred that while measuring performance, project level is more characteristic than the organizational level (Kagioglou et al. 2001). The construction industry is a very dynamic industry that accommodates different uncertainties regarding new technologies, budgets, and development processes. In order to cope with these uncertainties, different interrelated components which influence performance should be considered. Within the context of this research, the components that are considered as the competencies of a construction company are “strategies and resources” of the company, “the strength of its relationships” with other parties as well as the “project management competencies”. From this point of view, subjective resources such as financial assets or technical competencies have the tendency to be neglected on purpose.

2.1 Project Performance

The mostly investigated and used critical success factors by researchers (eg. Chan et al., 2004) are time, budget/financial performance/profitability, health and safety, quality, meeting technical performance specifications, project objectives/goal attainment, functionality, productivity, satisfaction/expectation of client/contractor/customer/project manager/team, dispute resolution satisfaction/ conflict management, absence of conflicts/legal claims, professional image, aesthetics, educational, social, and professional aspects and environmental sustainability.

In the current study three indicators which were assumed to carry more importance than the other criteria were selected in order to cover factors affecting project performance. The indicators explained in detail below are shown in Figure 1.

- Project profitability is essential for a company's survival and growth in the business cycle. Financial success of a company can easily be understood by looking at this indicator.

- Client/user satisfaction is a significant characteristic of success in a project. In construction works, main factors affecting client satisfaction are the fulfilment of required technical characteristics of the project, conformance to specifications, completion of the facility within planned cost, time and quality, client orientation, communication skills and response to complaints (Ahmed and Kangari, 1995).

- Long-term contributions of the project to the company refer to a long-term strategic management process for gaining competitive advantage. Tactical considerations which are short-term have to be replaced with long-term and strategic decisions (Betts and Ofori, 1992).

2.2 Organizational Competencies

The language of performance can be best resolved and understood by accurate determination of the competencies of an organization. Within the context of this research, organizational competencies were determined as the "strategies and resources", "strength of relationships" and "project management competencies" of the construction company.

2.2.1 Strategies and Resources

A company's strategies and resources are the strengths that can be used to comprehend its competencies (Barney, 1991). They include the company's leadership characteristics, experience in the industry, research and development capabilities, innovation tendencies and strategy related competencies as shown in Figure 1.

- Leadership involves developing and communicating mission, vision, and values to the members of an organization. A successful leadership is expected to create an environment for empowerment, innovation, learning and support (Shirazi et al., 1996).

- Research and development capability deemed to have a positive impact on competitive advantage as a response to increased industry requirements that occurred as a result of globalization and competition between the companies.

- Project management strategies can be identified by referring to the mission of the company and the company's business environment.

- Investment strategies occur along several dimensions such as the resources of the company, financial decisions and research and development.

- Organizational management strategies involve decisions pertaining to the company's competencies such as planning, controlling and coordinating, as well as the

management of the informal relations among the different parties within the company (Barney, 1991).

2.2.2 Project Management Competencies

The construction industry is a project-based industry since contractors survive and grow based on the success they achieve in their projects. The project is at the core of the construction business and project management competencies can be used as a tool to maximize the success (Jaselskis and Ashley, 1991). Each construction project is unique but the managerial process is normally uniform across projects in a company. As the project is at the core of the construction business, project management competencies cannot be dissociated from overall company performance. Project management knowledge areas and skills have been investigated by many researchers (e.g. Hendrickson and Au, 1989). The most common of these factors adopted for this research are: Schedule management, cost management, quality management, human resources management, risk management, supply chain management, claims management, knowledge management and health and safety management.

2.2.3 Strength of Relationships with Other Parties

The strength of a company's relationships constitutes a social dimension of performance measurement (Kendra and Taplin, 2004). The "project performance" is influenced by the strength of relationships with the parties involved in typical construction projects such as public or private clients, regulatory agencies, subcontractors, labour unions, material dealers, surety companies, and financial institutions. The strength of these relationships is related to the mutual satisfaction of the parties, i.e., the realization of the expectations of the parties. The primary relationships those are of more importance than others include relationships with construction owners (both public and private), labour unions, and regulatory agencies.

- Relationships with clients concern the traditional rivalry between clients and contractors. In order to have good relations with clients, contractors should recognize clients' basic expectations relative to cost, time and quality (Ahmed and Kangari, 1995).

- Relationships with labor unions concern employment policies and practices and relates to the management of the human resources of the company. For example, if a company decides to cut cost, and along the way reduces its labor force, labor unions may show their dissatisfaction by threatening to strike (Arthur, 1992). Smooth labor relations pave the way to a dispute-free environment where the likelihood of strikes, slowdowns, and jurisdictional disputes is minimized.

- Relationships with the government are governed by the effects of government policies and the implementations of regulatory agencies on the construction industry. The construction industry constitutes a large portion of the economy of a country, forcing governments to accommodate construction companies accordingly.

The hypothesis taken in this study associated with already mentioned components are as follows:

Hypothesis 1 – " Project management competencies" have a direct impact on "project performance".

Hypothesis 2 – "Strategies and resources" of the company have a direct impact on "project management competencies" and an indirect impact on "project performance".

Hypothesis 3 – "Strength of relationships with other parties" in a project environment has a direct impact on "project management competencies" and an indirect impact on "project performance".

3 Research Methodology

Given the variables of the model described in the preceding sections, four constructs were developed to measure the latent variables "project management competencies", "strength of relationships", "strategies and resources", and "project performance". A questionnaire was then developed consisting of questions that inquire about the variables that measure the latent variables. The questionnaire was administered via e-mail and face-to-face interviews to 185 construction companies established in Turkey. The target construction companies were all members of the Turkish Contractors Association (TCA) and the Turkish Construction Employers Association (TCEA). The 185 companies received an e-mail describing the objective of the study, inquiring about their willingness to participate in the study and requesting a face-to-face interview with an executive of the company.

Forty seven questionnaires were completed, the majority of which were administered by face-to-face interviews. The rate of response was 25%. However, considering the fact that there were other construction companies in the industry which were not members of TCA or TCEA but showing similar characteristics with the member companies of these two associations in terms of size and type of work undertaken, a decision was made to expand the survey by including 26 additional similar companies selected individually through personal contacts. At the end of the extended survey, there were 26 more completed questionnaires, bringing the total number of respondents to 73. The respondent construction companies also gave information on projects that they have held during the last five years of which total number reached to 350. Each variable associated with the survey questions was described in the preceding sections and presented in Figure 1.

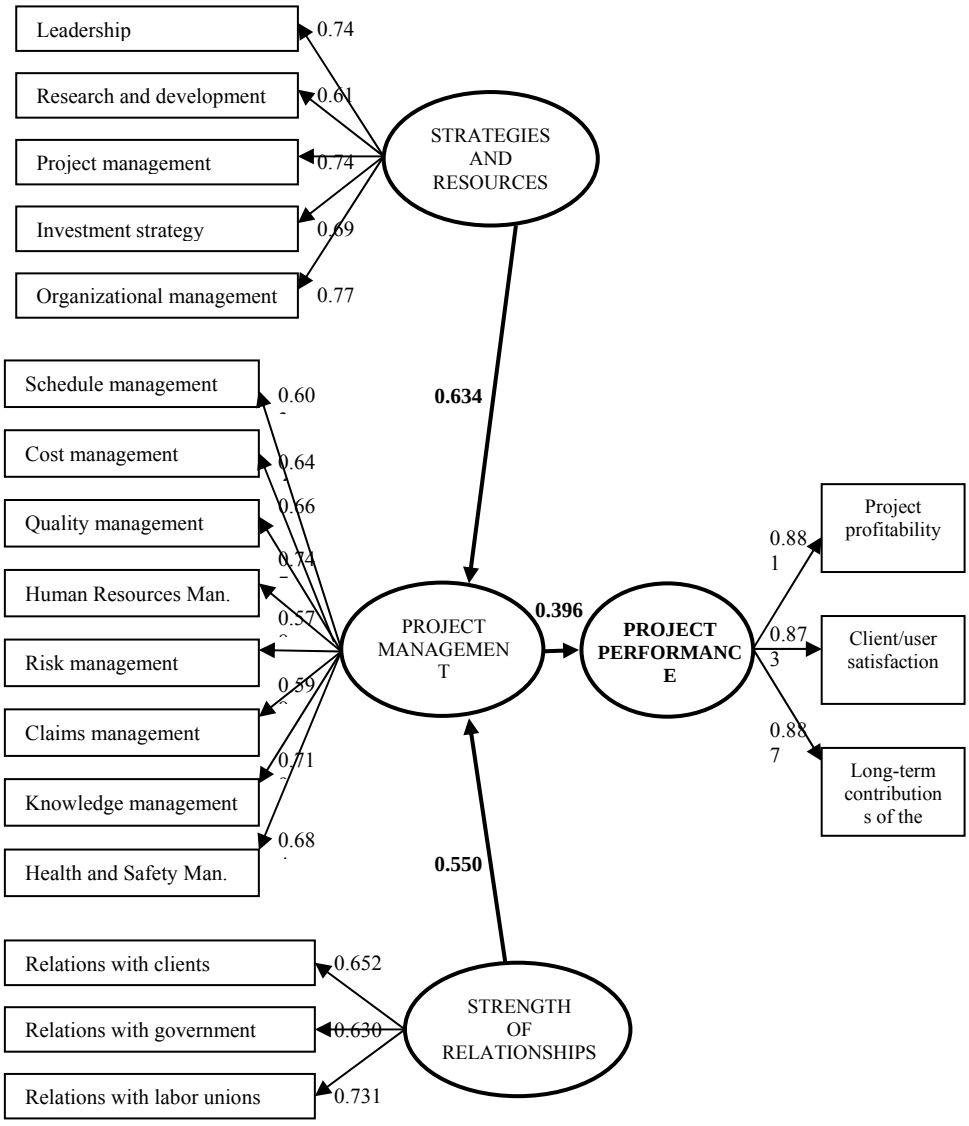

Figure 1 – Structural equation model with factor loadings and path coefficients

Structural equation modelling (SEM) is a statistical technique that combines a measurement model (confirmatory factor analysis) and a structural model (regression or path analysis) in a single statistical test. Data obtained from the 73 completed questionnaires were analyzed by using an SEM software package called EQS 6.1. The selection of SEM for use in this research was based on the structure of the proposed model that is composed of a number of direct and indirect interdependencies between the independent and dependent variables.

In the SEM process, the proposed measurement model must be validated through confirmatory factor analysis (CFA). While conducting CFA, construct validity should be satisfied by using content validity and empirical validity tests. Once the

measurement model is validated, the structural relationships between latent variables are estimated and finally the structural model is established (Anderson and Gerbing, 1988).

Within the process of structural equation modelling, a theoretical model which represents the latent variables with their constituent variables and their relationships has to be specified initially. The variables of the structural equation model prepared for this purpose was assessed in the presence of all the other variables of the model. The factor loadings of the model are presented in Figure 1 marked next to light arrows. All factor loadings in Figure 1 are statistically significant at α=0.05 and display rather uniformly high values indicating that the latent variables are represented quite well by their constituent variables. The relationships between the latent variables were hypothesized as marked by the heavy arrows in Figure 1.

According to the path coefficients generated by the model, “strategies and resources” and “strength of relationships” with other parties have significant impacts on “project management competencies" with path coefficients of 0.634 and 0.550 respectively. These constructs appear to have indirect influences on “project performance” since “project management competencies” have a direct influence on “company performance” with a path coefficient of 0.396. All path coefficients have found to be significant and Cronbach’s alpha of the overall model has calculated as greater than 0.7 as recommended by Nunnally (1978). Indeed, Table 1 indicates that, non-normed fit index (NNFI) and comparative fit index (CFI) were found to be greater than 0.9, the χ2 to degree of freedom ratio (dof) was satisfactory as it was smaller than 3, and RMSEA implied a good fit with a value smaller than 0.1, satisfies the thresholds suggested by Kline (1998).

Table 1. Initial and final model goodness of fit indices

Fit indices	Recommended value	Initial model	Final model
Non-normed fit index (NNFI)	> 0.9	0.822	0.907
Comparative fit index (CFI)	> 0.9	0.843	0.921
Root mean-square error of approximation (RMSEA)	< 0.1	0.094	0.074
χ2/ degree of freedom (dof)	< 3	1.67	1.38

4 Discussion of the Findings

According to the findings, all criteria including Cronbach’s alpha values, factor loadings, path coefficients and goodness of fit indices which are used to measure the reliability of the model have found to be highly satisfactory as shown in Table 1 and Figure 1. Therefore hypothesis which were assumed at the beginning of the study have been verified.

Hypothesis 1

The positive influence of project management competencies on project performance is inevitable that the majority of researchers who have commented on the determinants that take a project to success or failure, have pointed out the importance of “project management competencies” among other criteria (e.g., Larson and Gobeli, 1989; Chua

et al., 1999; Brown and Adams, 2000; Cooke-Davies, 2002; Chan et al., 2004). Pinto and Mantel (1990) have also identified managerially controllable factors as the causes of project failure. Jaselskis and Ashley (1991) have associated project management with the competencies of a project manager and suggested that the probability of success may depend on the optimal allocation of project management resources. It appears that "project management competencies" have a strong and direct effect on "project performance".

Hypothesis 2

According to the strategic management literature "strategies and resources" are defined as the strengths of a company and the strengths of a company have the potential to be translated into an opportunity for the company as well (Barney, 1991; Porter, 1980). The strategies and resources in a company differ from each other depending on the size of the company and the competitive environment that the company enrolled in. In order to have a positive impact on performance, King and Zeithaml (2001) and Barney (1991) have identified the preferable characteristics of resources of a company as valuable, rare, inimitable, and lack of substitutes. Even though resources and capabilities are not assumed to be identical, these characteristics are inevitable. It follows that a construction company's resources have to be sophisticated enough to prevent imitation by competitors. Regarding the highly satisfactory results of the analysis, it can be asserted that "leadership" in a company can be efficient in the execution of all project management activities, "research and development capability" can be considered as a source of competitive advantage which has the potential to show itself in means of innovative scheduling techniques, cost estimation methods, contract types or keeping organizational memory for managing knowledge and "strategy related" components of resources have the tendency to manipulate the course of actions in a project that are conducive to effect the performance of a project significantly.

Hypothesis 3

Even though the effects of "project management competencies" on project success have always been considered to be inevitable, (e.g., Jaselskis and Ashley 1991; Chua et al., 1999; Brown and Adams, 2000; Cooke-Davies, 2002; Chan et al., 2004), the "strength of relationships" criterion has rarely been discussed in the construction management literature.

However the analysis of the current study pointed out the considerable impact of "strength of relationships" on "project management competencies" and also the indirect impact on "project performance". Positive influence of strong relationships was discussed and confirmed also in the literature (Hausman, 2001; Pinto and Mantel, 1990; Dissanayaka and Kumaraswamy, 1999; Dainty et al., 2003). Strength of the relationships between the contractor and the client facilitate the operations and help to achieve better performance which means that "strength of relationships" with other parties in a project environment can be considered as a prerequisite for the effective use of "project management competencies".

5 Conclusion and Further Research

It was hypothesized in this study that project performance is influenced by organizational competencies of the company such as "project management competencies" as well as "strength of relationships with other parties" and "strategies and resources". A SEM model was set up to measure the four latent variables (project management competencies, strategies and resources, strength of relationships with other parties, and project performance) through their constituent variables and to see if the hypothesized relationships exist (Figure 1). According to the findings of the SEM analysis, Cronbach's alpha coefficients of all the latent variables were well over the 0.70 minimum set by Nunnally (1978) and indicated that the internal reliability of the constructs was quite high. The internal reliability of the overall model was also found to be 0.927 which is an excellent result. CFA showed that all factor loadings presented in Figure 1 were significant at α=0.05. The goodness of fit indices presented in Table 1 consistently indicated a good fit.

Based on the findings of this study it can be concluded that each hypothesis which were set at the beginning of study have been verified by the path coefficients shown in Figure1. The "project management competencies" have a direct impact on project performance, while "strategies and resources" and the "strength of the relationship with other parties" also appear to have an indirect but a significant impact on project performance. As a result, this research indicates that, in order to increase the performance of a project, long-term strategies and intangible measures such as investigated in this research have to be stressed as well as the tactical strategies and traditional tangible assets (e.g. financial resources, technical competencies, and so on).

Through the findings of this study, construction of the link between the performance of a project and the company itself is the further step of this ongoing research. In this sense, while a project is going to be considered as a small portion of a bigger picture for the contractor, performance measurement of the company will be investigated through its advantages in means of strategic-decision making, resources and capabilities of the organization, social dimensions (e.g. strength of relationships with other parties) and external factors (e.g. market, competition).

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Evaluating Building Performance for Offices Buildings

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Abstract:
There is general acceptance by Facilities Management practitioners that failure to obtain feed back on the building performance can expose the facilities to serious consequences. Evaluating building performance is becoming a necessity in effectively observing the overall perspectives of facilities. However, not every FM organisation performs this exercise on a regular basis. There are many obstacles that prevent the evaluation being conducted effectively such as lack of funds, lack of expertise and awareness of the importance of building maintenance. The implementation of various performance levels in planned maintenance requires not only the standardisation of the condition assessment method, but also the related planning methodology. There are different facilities performance evaluation approaches in practice such as post-occupancy evaluation, usability, users journey, post-occupancy review of building engineering (PROBE) and building performance evaluation to mention but a few. These have their strengths and weaknesses. Through a critical review of extant literature, the paper examines these, and how they all contribute towards keeping the performance of facilities to an acceptable standard. The paper also considers the levels of need for particular evaluation methods from the facilities managers and owners perspectives. The paper concludes that an understanding of the pros and cons of the various evaluation methods is useful and allows effective decision to be arrived at in terms of appropriateness and suitability of an evaluation method.

Keywords:
facilities management, performance evaluation, offices buildings

1 Introduction

The introduction section should provide an overview of the article as well as the background and context of the paper. Starting from general to provide the 'big picture' moving down to specifics, this section should provide a rationale that justifies the research, i.e. why there is a necessity to conduct a research on this particular subject. This can be done by providing evidences of problems that needs solution and/or identified knowledge gap in a specific domain, level, geographical location, society, sector, industry, and so on supported by key references. As the response, a clear

research agenda can be described specifying research aim and objectives in order to clarify the purpose of conducting the investigation.

Following this, the author needs to describe in general how the research can be or had been done to satisfy the aim and objectives, i.e. a brief discussion on the research methodology. This should highlight the research design, data collection methods and data analysis conducted or to be conducted in the research. Research limitations, scopes and boundaries should be explained as well to manage the expectations of the readers/audience.

The findings of the research at this stage have to be outlined here emphasising on the originality and general contributions of the investigation and preferably specific contributions of this paper. It is also a good practice to clarify who exactly will or expected to benefit from such investigation. This should be closely linked to the research rationale, aim and objectives.

2 The Performance Evaluation

The definition of performance measurement, by consensus in the business management community, can be defined as quantifying the efficiency and effectiveness of an action (Kennerly and Neely, 2000). Hence, McDougall et. al. (2002) suggest that efficiency and effectiveness relate, as concepts, to Best Practice (efficiency) – the pursuit of perfection of a given approach, and Best Value (effectiveness) – the pursuit of the most economic (in the widest sense) approach.

According to Neely et. al. (1995), performance measurement is a topic which is often discussed but rarely defined. Hence, Sink (1991) suggests that performance measurement is a “mystery...complex, frustrating, difficult, challenging, important, abused and misused” function.

Measuring facility performance is a difficult activity, especially as performance measurement systems arouse suspicions of control associated with market station, managerialism and ‘new public management’. Performance measurement can, however, be used as means to improve communication and facilitate better service outcomes from the service and the building perspective, as well as respective governance. Facility managers are aware of the need to align facilities with the organisation’s overall aims and the objectives, but lack access to the relevant information and communication process to do so effectively. This is made all the more difficult as the facility, as an enabler of organisational process and outcomes, sits at the intersection of the building and service delivery, thereby straddling tangible and intangible performance aspects (Brackertz and Kenley, 2001).

Discussion of performance evaluation and assessment in facilities management lead to the findings by Alexander (1996) that identifies measurement of the performance as one of “three essential issues for the effective implementation of a facilities strategy”. Thus performance measurement has become increasingly important both for reasons of justification to general management and to support management and practice within the FM organisation. Preise and Schramm (2002) are of the view that in order to be able to

evaluate buildings in their different settings, the need exists to develop state-of-the-art building performance evaluation.

2.1 The need for evaluation and measurement

As facilities management role is to support the core business activities, it is always perceive as of secondary importance and performance evaluations frequently being abandoned. From a general management context and a classical point of view, Amaratunga and Baldry (2002) admitted that there is a need to assess performance in order to guide management decision making. Similarly, from a human relations' angle, there is a need to assess performance to know whether an initiative is producing the benefit intended. Feedback, involving performance assessment, is also listed as being one of the key concepts of general system theory (Kast and Rosenzweig, 1981).

Performance measurements also act as a driver to an innovation process in an organisation (Pitt and Tucker, 2008) and for delivery of effective service, timely and orderly (Enoma and Allen. 2007). For building facilities such as offices (Price, 2003), higher education centre (Fiancini, 2006), airports building (Enoma and Allen, 2007), healthcare building (Liyanage and Egbu, 2004) the needs of evaluation and measurement are more focus on the fitness for occupation, security, safety and health and usability of building facilities. Alexander (1996) however identifies measurement of performance as one of "three essential issues for the effective implementation of a facility strategy". Thus performance measurement has become increasingly important both for reason of justification to general management and to support management and practice within facilities management organisation.

2.2 Scope of Measurement

The facilities management services it self are relatively very broad and sometimes beyond the building related services. Williams (1996) cites that measurement of facilities has three main components, namely physical, functional and financial. Physical performance relates to the behaviour of the building's fabric and embraces physical properties such as structural integrity, heating, lighting, energy efficiency, maintainability, durability etc.. Functional performance concerns the relationship of building with its occupier and embrace issues such as space, layout, ergonomics, image, ambiance, communication, health and safety and flexibility etc.. Finally, financial performance arises from the physical and functional performance of the building and comprises capital and recurrent (life-cycle) expenditures, depreciation and efficiency of use etc.

There is wide range of choices in measuring facilities management performance reflecting the varied nature of the field (Kincaid 1994). For office building performance evaluation, the facilities manager must deeply understand the business nature of the organisation, the policy and objective and the work process in order to derive effective and efficient measurement tools. The aims and objective as well as the purpose of the performance evaluation being conducted must be clarified prior deciding the performance measurement technique to be applied.

2.3 Methods and Techniques of Current Practice

Guide to Post Occupancy Evaluation (2006) published by Higher Education Funding Council for England (HEFCE) suggest that in principles of conducting performance evaluation for building facilities, the evaluator should refined the existing established method to suits the needs of that particular facilities. There are many evaluation methods applies in the FM practices called by the different names and some different parameters. Simpson (1998) classifies the techniques for the assessment of performance in facilities management into three broad categories of perspective i.e. facilities side, external parties and core side perspective. However, on what ever method applies, there are similar characteristics such as systematic and synchronised appraisals, computer aided evaluation and analysis, combination of qualitative and quantitative data analysis and field observations by multidisciplinary team.

2.3.1 Building Quality Assessment (BQA)

It was initiated by Ryder Hunt in Australia in conjunction with Victoria University of Wellington under the umbrella company, Quality Assessment International, covering a range of building types. Due to that it's also suitable for office building performance evaluation. Via this performance evaluation, computerized system building appraisals are applied.

Clift (1996), defines the BQA as the degree to which the design and specification meets the requirements for that building. In BQA quality is a relative rather than an absolute concept. The BQA system divides the building into nine categories that establish a broad classification of user requirements. Categories 1-7 are concerned with what the building does for its users, i.e. the level of service it provides. Categories 8 and 9 are concerned with retaining that level of service. The categories are subdivided into a total of 138 measurable factors. The main nine categories are as follows:

BQA category	Description
1. Presentation	Appearance of the building and impression created
2. Space functionality	Factors that determine operation of spaces
3. Access and circulation	Access of people and goods, security
4. Amenities	Facilities or spaces for people
5. Business services	Electrical services and IT
6. Working environment	Environmental conditions
7. Health and safety	Mandatory and other H&S issues
8. Structural	Building structure and condition
9. Building management	Short and long term

In practice BQA is carried out by trained assessors who will visit the building as well as examine drawings and specifications. They will enter scores on a computer for the software to carry out the calculations and produce reports. It is possible to carry out an

assessment at drawing board stage and “what if” exercises can be undertaken to assess the impact of upgrading a factor.

2.3.2 Serviceability Tools and Method (ST&M)

According to Canada based International Centre for Facilities (1995-2000) ST&M provides a broad-brush, macro level method, appropriate for strategic, overall decision-making. This technique was developed in early 1980s. ST&M deals both with demand (occupant requirements) and supply (serviceability of buildings). It can be used at any time, not just at the start of a project. ST&M includes two matched, multiple-choice questionnaires and scales, formats for describing the organization, and function-based tools for estimating how much floor area an organization needs. It is also suitable for offices and workplace facilities performance evaluation as it is straightforward, easy to use and update, and simple yet comprehensive and systematic (ICF, 1995-2000).

2.3.3 Post- Occupancy Review of Building Engineering (PROBE)

The study of PROBE was established in 1995 and it provided one of the first systematic attempts to evaluate the modern workplace (BRI forum, 2001). Even though its used the approach of occupant questionnaire, they provide a rich source of valuable information on building performance, based on users feedback via questions and answer. Leaman and Bordass (1999) identifiy four ‘killer variables’ from the Probe studies that they believed affected the issue of workplace productivity. Yet, despite the increasing user interest in this important topic, little research was undertaken to determine the extent to which these conclusions have been reflected in the construction of new office accommodation – or to what extent this knowledge has been absorbed by the construction industry (BRI forum, 2001). The main objectives are to measure user satisfaction via occupant survey, to develop benchmarks for that particular building, to measure productivity or output and to measure and evaluate system performance.

2.3.4 Building Use Study (BUS)

The Building Use Studies (BUS) method was originally developed for the Office Environment Survey (Wilson et. al. 1989), and then adapted for the PROBE (see above) project (1997-2002) in the United Kingdom. The Building Use Studies survey method has the capacity to provide feedback for over 60 variables covering aspects of overall comfort, temperature, air movement and quality, lighting, noise, productivity, health, design, image and workplace needs. At this stage we have examined the key summary variables, with some additional detail for the environmental variables - temperature, air, lighting and noise. It is anticipated that further analysis with a larger dataset will be undertaken to cover the full range of variables. (http://www.usablebuildings.co.uk/WebGuideOSM/index.html). Its main objective is to measure the occupant satisfaction and level of productivity or output.

2.3.5 Kaplan and Norton (1992) Balance Score Card

Via Balance Score Card (BSC) assessment approach, the aims were to balance the four perspectives of performance; which was later refined by Brackertz and Kenley (2002) to suits the needs and objectives for local government facilities including schools, offices, community housing etc from the following perspectives.

- customer perspective
- building perspective
- service perspective; and
- financial perspective

It has become popular with industry because of its ability to combine a diverse set of performance measures that are aligned with the corporate mission. The central tenet is quite simple : performance must be measured against corporate aims balancing financial and non-financial perspective (Brackertz and Kenley , 2002). Apgar (1995) introduces almost the same concept of evaluation approach that using a score card system but its only restricted to property and building related metrics, and does not include outcome oriented performance indicator (Apgar and Bellew ,1995).

2.3.6 Hinks and McNay's Management-by-variance tools (1999)

Management-by-variance tools are assessing the effectiveness of the FM function by linking to its (internal) clients' requirements. This evaluation identifies gaps in the perception of facilities management function and its internal customers. However, this tools does not address the issue of how facilities can support the processes that allow the organisation to fulfil its strategic aims (Brackertz and Kenley, 2002). This tool is aimed at aiding FM organisation to achieve the organisation objective and does not relate directly to the specific use of the buildings in its evaluation.

Besides the techniques mentioned above there are various others that are offered by the practitioners in the UK such as De Montfort method – for functional performance practiced by architect, Design Quality Indicators (CIC DQIs) – end users questionnaires, Overall Liking Score – using 7 points scale questionnaire and diagnostic tools, Energy Assessment and reporting methodology for evaluating building energy use and potential saving etc.

2.4 Evaluation approach

Mainly the typical facilities (including public office buildings) used to collect the data on interrelation between building and user such as conducting questionnaires, interview (structured and non structured), field observation, walk-trough (as practice in 'users journey/experience'), workshop sessions, photographic survey, recording of the use of time and looking at the physical evidence (Zimring, 2007). Zimring also contended that FPE is differ from POE as it's involve a much wider range of measures such as technical, economical and organisational performance.

The tools that enable the collection of data have been listed by Chambers (2003) as follows:

visual inspection	maintenance records	analysis tools
surveys	remote video cameras	digital photos
interviews	expert evaluations, testing, etc	as-built (record drawings)
working observations	check lists	energy use records
recording instruments		

Fleming (2005) however is of the opinion that the technical performance indicator carried out via the (data collection) facilities inspection and investigation may be supplemented or challenged by perceptional analysis. As an evaluation output, a comprehensive report that can define the strengths and the weaknesses of a building and its facilities. The output from the data analysis may help the facilities manager and owner to make decisions and planning for any future changes and betterment to particular building.

2.5 The Challenges

The most challenging task that confronts facilities managers in this regard is to educate the facility owner to the benefit of such evaluation since they are keen to look into financially return on investment (ROI) and how such evaluation can give value added or retain their investment for future changes rather than non-financial outcomes. In another side, facility managers had to endeavour the technology and innovation changes. Among the unique challenges that confront facilities managers in this regard are as summarised:

- Rapid changes on innovations beyond our wildest imaginings;

- Limited resources available;

- Higher customers demand and expectation;

- Discretion rather than rules dominating; and

- Outcomes/result-oriented management flourishing.

To respond to those challenges and to enable FM organisation remain competitive for future demand, the efficient and effective performance management should be clarified, as Amaratunga (2000) suggests that:

- translate the FM vision into clear measurable outcomes that define success, and which are shared throughout the FM organisation and with customers and stakeholders;

- provide the tool for assessing, managing, and improving the overall health and success of FM systems;

- continue to shift from perspective, audit and compliance-based over-sight to ongoing, forward-looking strategic partnerships;

- include measures of quality, cost, speed, customer service, and employee alignment, motivation, and skill to provide an in-depth, predictive performance management system; and

- replace existing assessment models with a consistent approach to performance.

It is learnt that aspect of information and knowledge management need to give special attention in the performance evaluation in facilities management. For example Coopers (1998) suggests that understanding of learning process in organisation become a key requirement for the facilitation and optimisation of improvement and innovation.

Despite all the challenges and conundrums, performance evaluation for office building facilities remains indispensable. Valins and Salter (1996) suggest that the greatest influence upon an organisation's core objective is the functional performance of its property which account for 80-90 per cent of its total costs. The challenges in measuring performance for building and facilities as noted by Loosemore and Hsin (2001) is to face the difficulties notoriously to measure the impact of buildings upon the emotions, attitudes and behaviour of those who use them.

3 Research Methodology

This paper is a part of an on-going PhD research on knowledge management role in facilities management performance evaluation in Malaysian context. As at an initial stage of the research, a literature on the performance evaluation practice within facilities management practice is thoroughly reviewed. From an interpretive viewpoint, researchers tend to believe in social constructs and understanding of phenomena; whilst the critical position tends to reflect social critique - focussing on opposition, conflicts and contradictions of society. A case study and interview approaches will be employed in this research to facilitate the qualitative approach. Prior to the actual data collection, a pilot study using semi structured interviews will be conducted within selected facilities management organisation (public and privet sector) in Malaysia. The literatures reviewed in this paper have come from multiple sources i.e journals, text books, conference proceedings and websites.

4 Conclusion and Further Research

Different approaches of facilities performance evaluation generate varied findings. So various effort by parties involved in the performance evaluation to standardise the methodology, at least for specific types of facilities are carried out. Initiative from HEFCE (2006) to produce a guide to conduct a facilities performance evaluation for higher education to standardise the practice and outlines of the performance evaluation for universities in UK. Centre for Health Assets Australasia, University of New South Wales has developed a standard practice for health project and assets performance evaluation in Australia. In US the work for standard practice and procedure for conducting Post-occupancy Evaluation (POE) for correction jail centre was initiated by Wener (1994) from Polytechnic University Brooklyn. For office building, the guidelines' was developed by British Institute of Facilities Management (BIFM)(2006).

Office building owner, in UK particularly profit oriented organisation does not show significant interest to conduct a facilities performance evaluation. Even though the POE was neglected for more than 40 years, the public offices and premises have shown an effort to perform the performance evaluation. Cost of conducting such evaluation might be the problems and research towards significant cost and contribution towards its core business can be measured are very necessary.

As mentioned earlier in this paper, the complexity in office building and its facilities, it endeavoured to described how a research project can assist the future performance evaluation for modern or so called "intelligent" office building to respond to the challenge of developing a standardised POE methodology which has the capacity to provide consistent 'evidence based' information. The potential as well as limitations of the methodology that currently used will require further exploration in use. The most acceptance and practical techniques to suit offices facilities setting need to be explored and examined besides the critical success factors behind it.

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Relation between Criteria of Construction Project Success and Philosophy

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Abstract:
Criteria of construction project success have proven to be not only time dependent and context oriented, but also and above all, a philosophy related issue. Different schools of thought which have prevailed in the western world during the second half of the twentieth century and till today have had their impact on the perception of the success of construction projects. This paper will discuss the issue of project success, its criteria of perception, and will enlist the main schools of thought in the northern hemisphere, and how they impacted on the success criteria, and it will also discuss the current eventual convergence of these schools, and the anticipated emergence of philosophies which could be affected by other cultures yielding to different identification of success criteria

Keywords:
Project Success Criteria, Philosophy, System Thinking

1 Introduction

This is a research that runs between two domains, the project success domain which is a strategic project management issue, and some of the recent trends in the field of philosophical stands in the streams of the human thinking, that's why, it is essential to lay the ground by the introduction of some of the basic definitions in both of these fields.

Research methodology in this paper relied heavily on literature review of published research in the fields of philosophy, system thinking and project success, it also benefited from the survey done on United Arab Emirates Construction Projects (ElSaboni, Aouad and Sabouni, 2006). According to both the literature survey and the UAE survey, the question which is proposed is the following: What position should we take; Either we consider that project success is not the only criteria according to which we decide to do the project or not to do the project, and if this the case the project success criteria could be more narrowly defined, for example the 'employed' project manager for a construction project can consider his success criteria to be only the

budget, time, and scope. Or we consider the other view that those success criteria themselves should be more holistic, more of nD, and to respond to all project stakeholders, which what this paper votes for.

This research comes in parallel with the call for the construction sector to consider the need to "know why" against the prevailing trends of restraining our mind set to consider only the "know how" (Fernández-Solís, 2007-b). Part also of the motive towards this research is based on the hypothesis that 'The consideration of the philosophical foundation for the success perception will enhance our capacity to produce projects that are perceived as successful projects by the project stakeholders'.

1.1 Introduction- Philosophy

Philosophy has been defined in the of Oxford dictionary as "the study of the fundamental nature of knowledge, reality, and existence." The word philosophy is of Ancient Greek origin: φιλοσοφία (philosophía), meaning love of knowledge love of wisdom. Philosophy is distinguished by its critical, generally systematic approach and its reliance on reasoned argument, and reasoning involves a conscious attempt to discover what is true and what is best. As one way of coming to conclusions, reason is often contrasted to emotion, tradition and faith - the "rationalist" argument being that reason is the more reliable way to arrive at that truth, and the concept of reason is closely related to the concept of logic. It can be said that each philosopher defined the philosophy in a different way, and even to consider different things and answer different set of questions, for example the main question that was raised by Aristotle (384 BC – 322 BC) and Plato (428BC – 348BC) was about the main components of the universe, which remained as one of the major inquiries till the German Philosopher Kant (1724–1804) who selected his question to be about how the human mind thinks, accordingly many philosophers now consider that philosophy can be defined as the thinking about thinking, or the thinking about understanding (university of New Castle Philosophy Club, 2008) and for the purpose of this research we shall consider the philosophy to be the thinking about perception, and in particular thinking about the way we perceive success

Pragmatism is a philosophical movement which originated in the states as one of the contemporary western philosophies by William James (1842-1910), Charles Sanders Peirce (1839-1914), John Dewey (1859-1952), with an approach to truth that includes those who claim that an ideology or proposition is true if it works satisfactorily, that the meaning of a proposition is to be found in the practical consequences of accepting it, and that unpractical ideas are to be rejected (International Encyclopaedia of Philosophy). The early pragmatists joined both the Empiricist philosophy and Epicurus, philosophy (341-270 BC), their ideas adopted the empirical epistemology which is in agreement with the epicurean truth that is based on sensational perceptions and accepted the right morals to start from Epicurean definition of happiness. In short, accordingly it could be said that a pragmatic man is a practical man whose knowledge is scientific and his goal is to achieve happiness and success in his life, for an early pragmatist, success is about sensational, 'materialistic', and direct results. The truth in view of Traditional Pragmatist is deducted from practical reality, there is no absolute true or false proposal, only practical consequences can tell what is true.

However, new pragmatism has developed to consider different views of truth, accepting the existence of absolute truth (Boersema, 2008) even to consider a much wider perspective like Morton White (2006) who coined the "Holistic Pragmatism", for the purpose of this research it could be stated that for some of the new pragmatists, long term objectives and sustainable growth are essential components of success.

Many thinkers do not regard pragmatism as a philosophy but rather as a methodology for thinking, due to the fact that it does not propose a specific truth, but rather a changing one as the practical results yield up to be.

1.2 Introduction - Project Success

Project Success has been defined by the Association for Project Management (2006) as the 'satisfaction of stakeholders needs'. The subject of project success in general has been researched and published by prominent researchers worldwide (Kerzner, 1998, Turner, 2002, and others), and the flow of research about the success factors from the project managers' perspective has been continuing since the 1950s till today (Fortune and White, 2005; ElSaboni, Aouad and Sabouni, 2006) .

Success definition and measurement are considerably context oriented, being very much related to the overall environment and era where and when the project is undertaken or evaluated, accordingly this raises the importance of the cultural context (Beatham, 2004), in which it is demonstrated that in some cultures like the European environment where a considerable amount of research is invested, quite well developed models such as the criteria of the European Foundation of Quality Management (EFQM) Excellence Model (EFQM, 1999) have been developed. The subjective indicators of success which are difficult to quantify have been researched (Hughes, et al 2004), and found to be more influential particularly when evaluating the project beyond completion date. Many research efforts have been concentrated on determining the success factors that have the greatest potential of change, considering the different contexts and in relation to the different phases of the project life cycle (Besner and Hobbs, 2006).

Project management research differentiate between project success criteria which is used to determine the success of the project, and project success factors which, if implemented enhance the project chances of success (Turner, 2002); this paper will focus on success criteria.

2 Project Success Criteria

2.1 Definition

Success criteria are about having 'scales' according to which the project could be judged to be, or rather perceived to be successful. Some of these measures are quantitative; others are qualitative (Turner, 2002). Most well known 'traditional' criteria include the project to comply with the set budget as set by the project sponsor, to run by the planned schedule as predicted by the project manager, and to attain the quality measures set by the project stakeholders. These criteria which consider mainly the efficiency during the implementation stages of the project have led to project management be regarded as tactical (Kloppenborg and Opfer, 2002) which means not being strategic by many writers, of primarily North American publications (Jugdev and

Muller, 2005), but the need for strategic consideration among project managers has created the need to highly consider the success criteria which is mainly a strategic issue (APM BoK, 2004, Turner, 2002 and others)

In a survey conducted for the construction project in United Arab Emirates, ElSaboni, Aouad and Sabouni, 2006 adopted the soft system methodology to identify the perceived success and have enlisted success criteria as perceived in this particular context, compared with worldwide research, the list contained success criteria similar to other literature like Time, Quality and Cost, but reflected also an attention to criteria that have considerable 'weight' in UAE environment such as the No Claims, Minimum Variations, and Maintaining Relations. The results of this study have indicated the need for a deeper understanding of the success appreciation for different projects in different contexts.

2.2 Success Criteria currently

The views on project success have changed over the years (Jugdev and Muller, 2005), from the pioneers of this research on success criteria who considered the three aspects of success; cost, time and quality, to the increasingly wide angle or rather holistic thinking considering **more** stakeholders, longer periods and new dimensions.

Looking for the success criteria starts from knowing what the project will deliver and when (the project deliverables) and accordingly how achievement of those deliverables will be judged to be successful and hence the success criteria (Turner, 2002).

Wateridge, 1995 identified one success condition; that all stakeholders should have a common understanding of the success criteria before the start of the project, if not, usually it will lead to failure. Turner and Muller, 2004 added that it is necessary to remind oneself and the stakeholders of the success criteria and all to agree any changes, at configuration review points throughout the project.

Success criteria determination is very much linked to corporate strategy and its programme management (OGC, 2008) and benefit management (Reiss, 2006) which claims to be answering the 'Why' question which should have been asked by the construction industry (Fernandez-Solis, 2007), and the continuous measurement of criteria (through key performance indicators, KPI's) is needed for benefit realization (Pyne, 2004 and Reiss, 2006).

Traditionally, till the 1990's success criteria of an activity used to be defined as its completion within the constraints of time, cost, and performance, many additional success criteria are considered now by project management professionals (Atkinson, 1999, Anderson, 2006), some of which are generic to the whole profession of project management such as user satisfaction and minimum changes, some are specific to the construction industry such as satisfying health and safety requirement and friendly use of the environment. Safety is a good example when it became clear that the society can never look to a construction project as successful if people were killed during its construction, this can be the starting point for the society common will to be considered. Prominent project management writers considered maintaining corporate culture to be on the list (Kerzner, 2006). Many other criteria were discovered later, and it became

clear that another perspective is needed to define the success criteria using soft system thinking (Checkland, 2002)

This leads to having different perceptions of success between different stakeholders to the extent that the perception of success criteria has been used by some researchers to measure the success of the working relationship between clients and contractors (Bryde and Robinson, 2006). Turner, 2004 and Muller, 2003 consider three more success criteria concerned with high level of collaboration, structure of project management operations and availability of information.

Cooke-Davies, 2004 questions the philosophy of the 21st century which relates between the success and good, therefore according to this philosophy; if the project was successful it means it is unquestionably good, this relation needs to be revisited and iteratively redefined, the assumptions behind the success, the good, and the relation, and consequently the conclusions reached all need to be redefined continuously, probably for each and every project or at least for every contextual combination of time, environment, society and what we can name as the collective well of humanity. That could explain why researchers like De Wit, 1988 discussed both the difficulties of defining the success criteria and that of trying to measure it.

Lechler, 1998 emphasises the people side of project success, and Cooke-Davies, 2004 accordingly questions the validity of project success factors for different circumstances of context, time, team, and others and different types of projects, which gives justification for action research methodology in identifying success.

Confusion between success factors and success criteria may arise during project implementation, thinking of having the right design as an example. Another confusion may take place between success and good luck; this mixing have more chances the more is the time between project initiation and project assessment.

2.3 Project Success Criteria, Discussion

Everybody likes to be successful, there are even both spiritual stimulation and materialistic need for success to be everybody's aim, professionals like to benchmark against successful projects as best practice, property developers like to build as close as possible to successful developments. Success means growth, more money, more power, leads to good reputation and bright future, it makes the history, and hence stories of success are on every lip and in every mind. Hence, no wonder that Pragmatism considered that being successful meant being "right", and accordingly the success criteria is 'the criteria'. At the same time, one has to admit that many forces (environmental pollution, depletion of resources, financial crisis …etc) lead us to reconsider the way we used to live (Fernández-Solís, 2005), and one of the tools is to go back to the founding principles those forming the bases of our perception of success.

In seek for the definition of success, perception plays the major role (Baker, Murphy and Fisher, 1988), to the extent that what we could be looking for, should be rather named as the perception of success, that's why Jugdev and Müller, 2005, believe that success connotes different things to different people, the authors would like to add: "at different times", or as phrased by Larsen and Myers, 1999: "project success is a moving target", but the authors retract to say that "Common Will"(Rousseau, 1712-1778) of the

humanity does make its determination concisely on what success is at the end of the day. This kind of 'Holistic' thinking is needed when studying success, as success is a strategic matter and should be considered accordingly and not to based entirely solely on project by project basis (Reiss, 2000, and APM, 2000 and APM, 2005)

Success definition and measurement are considerably context oriented, i.e. very much related to the overall environment where the project is undertaken, accordingly this raises the importance of the cultural context (Beatham, 2004).

The success measurement have to consider and should take place during all project phases, two lines of thinking have developed on the two sides of the Atlantic about the extent of the project lifecycle, the North American literature represented and led by the PMI, PMBoK, 4th ed., 2000 and PMBoK 5th ed., 2004 have both considered the project life cycle to start from conceptual initiation through implementation till start of operation which could be represented in construction by the initial handing over, the "product life cycle" considered the actual "use" period till the termination of the facility, this tactic or rather 'mechanistic'(Frame, 1994) viewpoint which have lasted till recently roots back to the pragmatic philosophy born in the north American cultural environment (International Pragmatism Society, 2008). The European school considered the "extended project lifecycle" APM BoK 2nd ed., 2000, APM BoK 3rd ed., 2005, BS6079 1996, 2000, and 2002 have all considered this more of holistic (Checkland, 2002) definition of projects, this also stems from the philosophies that flourished in Europe (Seiler, 2008)

It took the North American project success researchers more than a decade to consider the wider angle of vision, as they were urged by researchers like Frame, 1994 to broaden their view of project management beyond the 'traditional' cost time budget iron triangle. Jugdev and Müller, 2005 have identified four phases from 1960 till 2005 of this development which led to the integrated modelling of success (section 3.1 of this paper).

In short it can be concluded that it has taken 40 years of gradual but slow trend towards consideration of stakeholders of the project and to assess the project beyond the 'limited' project lifecycle. Integrated modelling of success in the performance measurement in business has led to development of EFQM (EFQM, 1999) in Europe, and Balanced Scorecard in North America (Koplan and Norton, 1992 and 1996 and Radnor and Lovell, 2003).

3 Deeper inside the Philosophy of Success

The two schools of thought can be summarized as follows (ElSaboni, 2008):

The Pragmatic Approach, Philosophy of Success in the American pragmatic culture: This could be easily understood while reading the project success chapter in the Wiley Guide to Project Management, 2005 which is written by Terry Cooke-Davies; 2004 "In the world of the twenty-first century, "success", like its close relative "winning" seems to be an unquestioned "good".

The Holistic Approach: In line with system thinking which started with thinkers like Ludwig von Bertalanffy, 1901-1971, the project management thinking has extended both the time span of success perception and the environment under consideration towards external to the project within the organisation and external to the organisation to the overall context, and recently it has started to extend further, guided by soft system thinking (Winter and Checkland, 2003).

3.1 Development of Human Cognition of Project Success

Project management thinking in general started to emerge together after the system thinking emerged in the 1940's. In their retrospective look at project management success literature over the last forty years, Jugdev and Muller, 2005, demonstrate how the interest of project research has evolved over the last forty years, starting from project implementation views in the 1960's towards the strategic project management in the 21st century in the following order:

1960-1980s: Schedule considerations towards the triangle of cost, time and quality.

1980's-1990: Consideration of critical success factors, enlisted not integrated.

1990's till 2000: Started to integrate, and consider the corporation strategic objectives

21st Century: Holistic and Systemic.

Meanwhile, a further development in the philosophical thinking from the old school of pragmatism towards the neo-pragmatism has taken place, including holistic pragmatism of Morton White, 2004. It came also with the shift from traditional 'hard' system analysis towards soft system thinking (Checkland, 2002). The resultant trend of success appreciation tends to be more human, environmental friendly, spanning over a longer time considering more of project phases (Jugdev and Muller, 2005), considering more stakeholders, and being value laden after a period of scientific 'value free' project management.

The development of philosophical stands and human thinking is taking place simultaneously with the development of project success research, The authors of this paper build a hypothesis that it is actually the conceptualization of project success that evolves together with the human thinking changes and not just the research into project success, the project management research reflects what actually happens in the real world and feeds back into it in the forms of research, education and training. Accordingly, for the context of this paper, the data collected by ElSaboni et al, 2006 and researchers like Jugdev and Muller, 2005 has been extremely useful but utilized differently. This line of thought can be summarised in figure -1- which correlates between the trends of pragmatic philosophy, system thinking, and project success.

In general it can be said that the concept of project success affected by thinking trends has globally evolved (ElSaboni, 2008) through many axes of thoughts affected mainly by new trends in philosophical thinking:

Towards systemic and holistic thinking (Checkland, 2002).

From mechanistic tripod of quality, budget and time to wider criteria (Turner, 2002).

Toward more subjectivity (Hughes, et al 2004)

Towards soft system thinking (Winter and Checkland, 2003)

Different mechanism of success appreciation (El-Saboni, Aouad, and Sabouni, 2006)

Time dependency i.e. changing over time (Larsen and Myers, 2000).

Considering a wider network of stakeholders (APM BoK, 5th ed., 2006).

The holistic approach through its consideration of the whole instead of the sum of the parts and through the integration within this 'whole' context can consider both the natural environment and the social context among the success consideration leading to projects which are more environment friendly and more 'human'. It is at that point where sustainability meets with best practice of project management and even probably gets contained within. Accordingly and as an example of the interaction with the natural environment, it becomes a benchmark for managers of construction projects to be responsible for the ways of treating the wastes to come out of the demolished building, this consideration should take place early on during the design of the project while selecting the material and their specifications. Similarly but on the human scale the responsibility about the health and safety needs to be considered as one of the most important success criteria for evaluating the performance of the project manager not only during the construction but even at the early concept design stage, and not only for the site workers but considering the health and well being of all 'affected' stakeholders.

The authors of this paper intend to extend the scope of this research towards the social responsibility of the project manager towards the "General Will" (Rousseau, 1712-1778) of the whole human society, these natural, human and social issues will not complicate the practice, but rather puts it on track towards appreciating the context of nature and humanity not even being limited to any particular moment in time. A landfill which takes 50 years to be terminated and hundreds of years interacting with the natural resources is an example of how 'we' should think about 'our' projects. Again 'we' would argue that this does not complicate the issues of the project management but it would push new methodologies of 'thinking' and 'practice' using approach of 'soft systems' not as a replacement of but rather integrating with the 'hard system' thinking'.

The recent research does highly consider the human and people side of project management Bryde, 2005, called for consideration of Psychosocial KPI's, the ignorance of which leads to project failure and it downgrades the capability of the organisation by putting this behaviour as a barrier against long term sustainable improvement in project management performance (Kliem and Ludin, 1995).

It is the understanding of the authors that it is not the sophistication of intelligentsia that led to these considerations but it is rather the revealing of the actual reality which is taking decades of the human thought in the field of project management and particularly in the field of the construction industry, the project can never be considered successful if it led to the killing of workers during the construction or harmed the natural

environment or contradicted with justice and human essential values, perception of success in the human minds have always been this and shall continuously be this way, deviations of human thought could take place once and a while but it always comes back on track, and the only problem most of the time is with the researchers to find out what has already been there all the time.

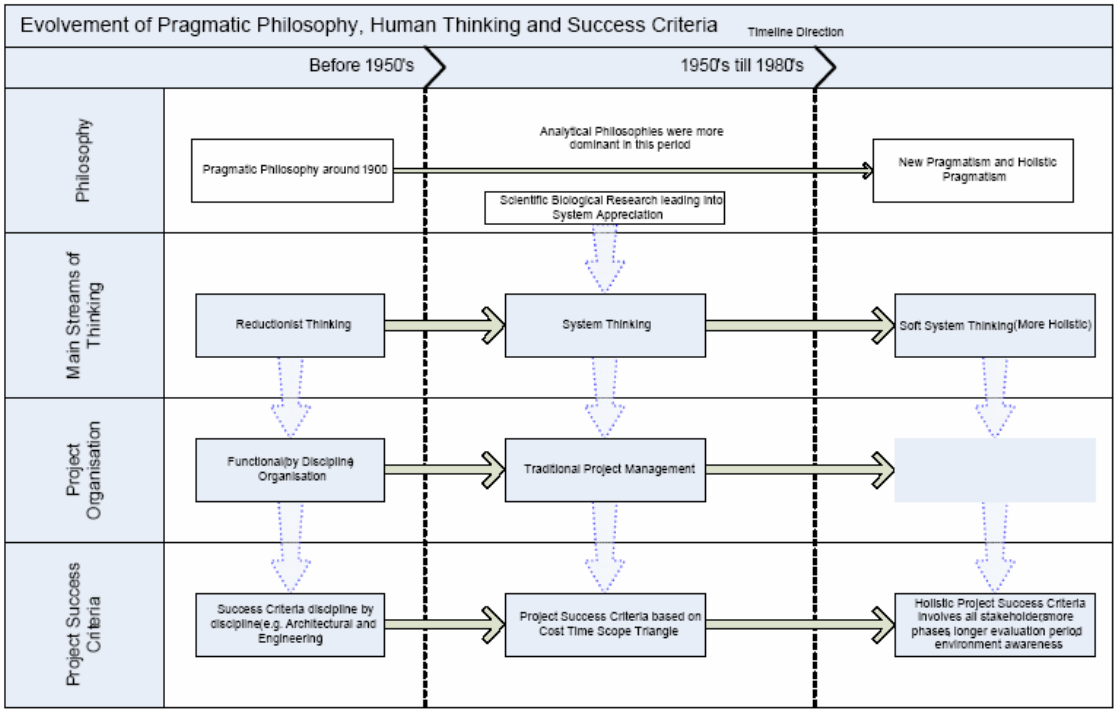

Figure -1-: correlation between the trends of pragmatic philosophy, system thinking, project organisation and project success criteria starting from the 1950's till today.

4 Critical View

If this subject of the meaning of success could be looked at from Semantic point of view, i.e. what is the denotation that links between the word 'success' and the **reflection** that this word creates in the mind, for example, if the question of construction project success was addressed to construction project managers, the majority of which are from civil engineering education and modern project experience (both of which are based on Pragmatic Philosophy background), the success would denote money , quality of construction and finishing the project on time, and probably some would say about the purpose and scope, and almost according to all of them, the success criteria would classify the Wall of Berlin as a successful project.

The issue of fragmentation in the construction industry (Latham, 1994 and many others) cannot be resolved if the pragmatic philosophy would remain as the basis for success perception; the individualistic consideration will govern. Most of the approaches to tackle the fragmentation issue have been either:

Dealing with the symptoms and not the cause

Using the hard analytic approach (Fernández-Solís, 2005), while the soft system thinking (Checkland, 2002) is the one that needs to be followed to tackle such an issue.

Finding the solution through merging the individuals under a single control system like in manufacturing industry.

Trying to minimize the need for systemic social considerations by eliminating the human involvement through lean modeling, example of which is the prefabrication, precasting…etc,

The construction industry failure to solve its inefficiency problems reveals the lack to understand the systemic nature of the industry (Fernández-Solís, 2006)

5 Conclusions

The perception of project success in any society is linked with the prevailing philosophy.
The approach towards identifying project success criteria needs to be:
Socially wise, more systemic.
Deeply rooted and linked with philosophical background.
The current construction project success criteria as defined in the available literature, are based on the pragmatic philosophy which dominated the American society in the twentieth century.
The traditional pragmatic considerations of success in construction projects in traditional project management practice did not consider issues of environment and values.
The concepts of success are dynamic in their interaction with the social context; accordingly we witness a shift towards new success criteria. At the same time we witness the new pragmatism philosophy in which consideration of long term benefits related to environment, values among others are considered.

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Safety and health practices in construction: an investigation among construction workers

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Abstract:
The construction industry has been recognized as one of the most hazardous industries. It has a poor safety record when compared to many other industries. Although there is an improvement of the safety performance and increase in safety awareness in this industry, the injury rate is still one of the highest across all sectors. Besides causing human tragedy and economic losses, construction accidents also affect the productivity and reputation of the construction industry. The specific objectives of this research are to find out the opinions of construction workers about safety and health practices in construction projects; the factors causing construction accidents; and their knowledge about safety and health regulations. Within this context, semi-structured interviews were carried out among 35 Turkish construction workers. The companies they work for have been operating in the North-West region of Turkey. The interviews took place over a 3 month period between January and March 2008 and each lasted approximately 1 hr. The survey questionnaire was administered during face-to-face interviews. Based on the results, more than half of these workers experienced an accident in the past and the majority of them had never received any safety training.

Keywords:
Construction accidents, Construction workers, Safety, Turkey

1 Introduction

The construction industry has been recognized as one of the most hazardous industries in which to work (Carter and Smith, 2001). It has a poor safety record when compared to other industries. Accidents on construction sites are still a major problem in this industry. According to the U.S. Department of Labour, Bureau of Labour Statistics, the incidence rate of injuries and illnesses in the construction industry was 6.3 cases per 100 full-time workers in 2005 (U.S. Department of Labour, 2005). For 2002, this rate was reported as 7.1. In Table 1, incidence rates of nonfatal occupational injuries and illnesses by some selected industries are illustrated (U.S. Department of Labour, 2005). Moreover, the distribution of accident rates according to selected industries in Turkey is illustrated in Table 2 (Turkish Ministry of Labour and Social Security, 2005). As seen from this table, the construction industry has also a high accident rate in this country.

Although there is an improvement of the safety performance, injury rates in this industry are still 50% higher than that of all industries (Huang and Hinze, 2006). Davies and Tomasin (1990) indicated that the risk of a fatality in the construction industry is five times more likely than in a manufacturing based industry.

Table 1. Incidence rates of nonfatal occupational injuries and illnesses by selected industries and case types (USA, 2005)

(Source: U.S. Department of Labour, 2005)

Industry	Total recordable cases (per 100 full-time workers)	Cases with days away from work (per 100 full-time workers)	Cases with job transfer or restriction (per 100 full-time workers)
Mining	3.6	1.5	0.8
Oil and gas extraction	2.1	0.9	0.3
Mining (except oil and gas)	4.1	2.0	0.7
Support activities for mining	3.9	1.2	1.0
Construction	6.3	2.4	1.0
Construction of buildings	5.3	2.0	0.8
Heavy & civil eng. construction	5.6	2.1	1.1
Specialty trade contractors	6.8	2.6	1.1
Manufacturing	6.3	1.5	2.0
Food manufacturing	7.7	1.6	3.4
Wood product manufacturing	9.4	2.5	2.7
Primary metal manufacturing	9.1	2.2	2.6
Transportation and warehousing	7.0	2.9	1.7
Air transportation	9.9	5.3	2.2
Rail transportation	2.5	1.6	0.2
Water transportation	3.9	1.8	0.6

Table 2. Distribution of accident rates according to selected industries in Turkey (2005)

(Source: Turkish Ministry of Labour and Social Security, 2005)

Industry	Accident rate (%)	Industry	Accident rate (%)
Mining	8.0	Textile	8.0
Construction	8.7	Primary metal	6.7
Machinery manufacturing	6.6	Food	3.2
Transportation	5.3	Metal products	14.0

2 Literature Review

The safety performance of the construction industry has been improving and health and safety has been recognized as an important business performance subject (Myers, 2003; Wilson and Koehn, 2000). The factors causing construction site accidents have been addressed by several researchers. Toole (2002) listed the main causes of construction accidents. These are lack of proper training, deficient enforcement of safety, lack of safety equipment, unsafe methods or sequencing, unsafe site conditions, not using provided safety equipment, poor attitude toward safety, and isolated, sudden deviation from prescribed behaviour.

Researches also show that the main causes of the fatalities in construction are due to falls, struck-by incidents, caught in/between incidents and electrocutions. It has been also indicated that the most significant factor in construction site accidents is the unsafe behaviour (Dester and Blockley, 1995; Sawacha *et al.*, 1999).

Construction accidents result in great economic losses. In their study, Everett and Frank (1996) found that the total costs of accidents lies between 7.9% and 15% of the total costs of non-residential, new construction. Furthermore, Coble and Hinze (2000) showed that the average workers' compensation insurance costs could be estimated approximately 3.5% of the total project costs. Besides causing human tragedy and economic losses, construction accidents also affect the productivity and reputation of the construction industry (Kartam, 1997). Some examples are demotivated construction workers, delay of project progress, training of replacement personnel and equipment damage.

Hinze et al. (2006) examined 136,000 construction worker injuries. They examined the potential impact of minor injuries in terms of numbers of workers affected and average cost per injury. They found that over half of the injuries were associated with lacerations and injuries sustained by the lumbar spine, upper extremities, or eyes.

In the last years, many software applications have been developed to facilitate health and safety management in construction. One of the common aims of these systems is to improve health and safety management applications during the project. These systems rely mostly on safety database systems. There has been also some safety systems developed to address the health and safety training issue. An example of improving safety on-site is the study of Oloufa *et al.* (2003) who developed and implemented technologies for vehicle tracking and collision detection. In their study, they used Global Positioning System (GPS), wireless and web-based technologies. They demonstrated the use of Fujita tele-earthwork system; consisting of dozers, backhoes, trucks, and other vehicles and equipment which all operates without on-board drivers.

The importance of safety training to improve the safety performance in the construction industry has been addressed by many researchers (Huang and Hinze, 2003; Aksorn and Hadikusumo, 2008). Effective training of construction workers can be one of the best ways in improving site safety performance (Hislop, 1991; Tam *et al.*, 2004). In the study of Zeng *et al.* (2008), it has been pointed out that some accidents such as falling from height and hit by falling materials in construction could easily be prevented from implementing training programs to employees. In the same study, it has also been found

that many workers in the Chinese construction industry had received limited education about safety issues (Zeng *et al.*, 2008). Similarly, in the study of Dingsdag *et al.* (2008) construction workers identified training as a necessary element of safety performance.

Many studies have shown that there is a close relationship between individual safety behaviour and safety performance (Tarrants, 1980; Sawacha *et al.*, 1999). Effective training of workers can also significantly reduce unsafe behaviour. As Fang *et al.* (2006) stated, workers with good safety knowledge have a more positive safety climate than those with poor safety knowledge.

Langford *et al.* (2000) identified the critical factors that influence the attitudes of construction workers towards safe behaviour on construction sites. According to the results of their study, training of operatives and safety supervisors is important to safety awareness and improved performance. Moreover, it has also been found that knowledge and competence influence personal safety performance. They also stated that companies must maintain and update their workers' skills and knowledge by training, skill updates and effective on site communication (Langford *et al.*, 2000).

Besides minimizing construction accidents, successful training can also minimize project delays and damage to company image (Findley *et al.*, 2004). On the other hand, lack of safety training of construction workers has been considered as one of the important causes of construction accidents (Gervais, 2003).

As a result, safety training and knowledge of construction workers about safety and health practices are critical issues for improving safety performance in the construction industry. Within this context, one of the specific objectives of this study is to investigate Turkish construction workers' knowledge about safety and health practices. Although there is an increase in safety awareness, there have been few studies in the Turkish construction industry about safety and health management practices (Colak *et al.*, 2004), and workers' safety knowledge which is highly essential for successful safety and health practices. Therefore, this study also aims to contribute to the existing literature by investigating the safety and health practices in Turkish construction industry. Moreover, the opinions of construction workers about safety and health practices in construction projects, and the factors causing construction accidents have also been examined through face-to-face interviews.

3 Research Methodology

The research was carried out among 35 Turkish construction workers. Data were collected through a combination of face-to-face interviews and the survey questionnaire. The survey questionnaire was administered during face-to-face interviews.

Questionnaire surveys have been widely used to describe safety climate (Fang *et al.*, 2006). Safety climate is 'a summary concept describing the employees' beliefs about all the safety issues (Guldenmund, 2000). As Ojanen *et al.* (1988) argued, the only way to measure the safety climate is by surveys. Therefore, this method was selected as the mode of data collection in this study. Moreover, in order to provide enhanced understanding of the concept of safety and health practices and get detailed information

from the workers, the interview technique has also been thought as the most appropriate method for this study.

The survey questionnaire consisted of 26 questions including both closed and open-ended questions. It is divided into two main sections. Section 1 covered general information about the worker. Section 2 dealt with safety and health practices in construction projects; the factors causing construction accidents; and worker's knowledge about safety and health regulations. The interviews took place over a 3 month period between January and March 2008 and each lasted approximately 1 hr. There were no criteria established for construction worker selection. The companies they work for have been operating in the North-West region of Turkey.

4 Findings and Discussion

A total of 35 construction workers participated in this study, including 14 unskilled (40%) and 21 skilled (60%) workers. Eight of the 35 workers do not have any education degree, whereas eleven workers have a primary school degree, seven workers have a mid-school degree and nine workers have a high school degree.

The majority of the participants (77%) have more than 6 years of experience in the construction industry. On the other hand, only 2 out of 35 participants have less than one year experience in this industry.

Safety and health training programmes can provide several advantages in preventing possible accidents in construction sites. Within this context, the respondents were asked whether they received any kind of safety training in the past. According to the responses, it was determined that the majority of the participants (26 out of 35) had never received any safety training. On the other hand, nine out of 35 interviewees stated that they had participated in this kind of training in the past. It was interestingly to be noted that only 3 of these workers had received a professional safety training programme provided by their companies. Two participants noted that instead of formal training programmes, mostly informal briefings were used in their companies. According to the given information, it is obvious that there is a lack of safety training programmes in the majority of the companies.

The respondents were asked for their opinions about the precautions taken in construction sites regarding safety and health practices. The majority of the participants (25 out of 35) saw the safety and health practices in their sites as sufficient. However, some of these participants also commented that without any safety training these precautions could be meaningless and may result in unsafe behaviour and possible accidents.

More than half of the interviewees indicated that they experienced an accident in the past. In Table 3, the list of the reasons of construction site accidents experienced by these workers are illustrated. As shown in this table, falls are the main causes of construction accidents experienced by the participants. Three participants reported that the accidents they experienced resulted in serious injuries and loss of their job positions. The remaining interviewees indicated that although the accidents led to minor injuries, they resulted in loss of motivation and reduction in efficiency.

Table 3. Distribution of accident causes

Cause of accident	(%)	Cause of accident	(%)
Falls from building	21.0	Electrical accident	10.5
Falls from scaffolding	31.7	Faulty machinery	10.5
Object fall	10.5		
Lacerations	15.8	Total	100

The majority of these workers also reported that they witnessed construction accidents in the past. Like their own experiences, falls (56%) were the main reasons of construction accidents experienced by their colleagues. The distribution of the remaining causes was quite similar with their own experiences.

One of the specific objectives of this study was to find out the opinions of the construction workers about the possible factors causing construction accidents. According to the responses, five main factors causing construction accidents were determined. The distribution of these factors is illustrated in Table 4. Many of these causes are similar to those proposed by Abdelhamid and Everett (2000) and Toole (2002). Poor attitude toward safety was considered as the most important factor. This result correlates well with the previous researches in the literature in which unsafe behaviour was also considered as one of the main important factors leading accidents (Sawacha *et al.*, 1999).

Unsafe site conditions and lack of knowledge and safety training were the following highlighted factors that can cause construction accidents. Unsafe site conditions, lack of knowledge and training, defective materials and lack of safety equipment can all be attributed to poor safety and health management by the companies. On the other hand, poor attitude toward safety can be attributed to unsafe act by the workers.

Table 4. Factors causing construction accidents

Factors	(%)	Factors	(%)
Poor attitude toward safety	28.6	Defective materials	17.1
Unsafe site conditions	25.7	Lack of safety equipment	5.7
Lack of knowledge and training	22.9	Total	100.0

As mentioned earlier, having knowledge about safety and health regulations can provide advantages in preventing possible accidents in construction sites. Within this context, the respondents were asked their knowledge about safety and health practices in construction. More than half of the respondents (20 out of 35) stated that they do not have enough knowledge about these practices. The same participants also indicated that there is a need for an education about safety and health issues. Moreover, more than half of the participants reported that they need also training about technical issues, e.g. training about their professional jobs.

5 Conclusion and Further Research

This study is based on interviews with construction workers from the Turkish construction industry. The analysis of the interviews showed that construction workers do not have enough knowledge about safety and health practices in construction. The results of the study could be summarized as follows:

- There is a lack of safety and health training programmes in the majority of the companies. Informal briefings are generally used instead of formal training programmes.
- More than half of the workers experienced an accident in the past. Falls are the main causes of construction accidents.
- Poor attitude toward safety, unsafe site conditions and lack of knowledge and safety training are the most important factors causing accidents.
- More than half of the workers do not have enough knowledge about safety and health practices.

Based on the results, it seems that the companies have to focus more on formal training programmes regarding safety and health practices to minimize construction accidents. Moreover, the companies can interact with the worker's and control their behaviours towards safety and health practices. This action can help to improve their attitudes towards safety issues. Unsafe site conditions can significantly increase the possibility of construction accidents. Thus, companies also have to control site conditions regularly in order to prevent possible accidents. It is obvious that all parties involved in a construction project should be concerned with the safety regulations to obtain a better safety performance.

The findings from the study should be interpreted with caution since the research was limited with only 35 workers. However, it is believed that they can give a general idea about the construction workers' knowledge regarding safety and health practices in construction. Future researches that can be carried out among a greater number of workers can provide a comparison of the results with this study and studies conducted in other countries.

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Using Fault Tree Analysis Strategy to Evaluate Satisfaction in Relation to Time

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Abstract:
The construction industry needs to face the challenge to satisfy not just its project owners, but also other members and participants of the project team. Satisfaction has been identified and highlighted as a fundamental issue for participants of a construction project. In order to attain high client and/ or participant satisfaction, it is vital that the construction industry maintains a long-lasting commitment of the criticality of satisfaction from the highest (top) to the lowest (bottom) level. However, to achieve this, a logical and systematic approach that enables a combination and integration of the project participants, in terms of improving their satisfaction levels is required. This paper presents the significance of the application of the fault tree analysis strategy for satisfaction evaluation and assessment. It involves an integrated approach that considers the supply chain of a construction project as a tree structure. Relationships and interactions of the participants, and how these affect the overall satisfaction levels of a single project with respect to time, are analysed based on current practices in satisfaction.

Keywords:
Client, Construction, Fault Tree Analysis, Project Participant, Satisfaction

1 Introduction

The construction sector needs to evaluate the different attributes of satisfaction to ensure total or complete satisfaction. Satisfaction is produced through a combination of response in meeting the needs of the customer (Jonsson and Zineldin, 2003). In the context of this study, satisfaction attributes are defined as the needs and parameters required and specified by construction clients and the project participants to ensure their satisfaction.

Research in construction have clearly highlighted detailed requirements of the client, with little emphasis on the requirements of other members of the construction project team. Considering that the construction project involves several phases that link different professionals (Yang and Peng, 2008), the outcome of a particular project phase has an effect on the succeeding phase. Therefore adequate recognition and understanding of the requirements of the project participants in a given phase is critical. This is because where there is a flaw in meeting these requirements, it results in

dissatisfaction of the participants. Kärnä, (2004) stressed and showed the significance and importance of the relationship between the project team, in terms of ensuring satisfaction. Therefore, an acknowledgement of each participant and their satisfaction attributes is paramount to improving satisfaction in the construction sector.

Though there exists the awareness on the need to satisfy the client, in most cases, the construction industry lacks the ability to look at the effect the satisfaction of other project participants has on the satisfaction of the client. Thus, a proactive process that can be used to strategically highlight the importance associated with the satisfaction attributes of the project participants by enabling the relationships and integration of the participants and their requirements (satisfaction attributes) is necessary. In view of this, the Fault Tree Analysis is a logical process that has shown to be an effective graphical technique for integrating different factors; hence it is employed by this study to enable integration of the construction project participants and their specified satisfaction attributes, in terms of improving their satisfaction.

2 Fault Tree Analysis (FTA)

The FTA is a deductive approach or structure (Wong and Yeh, 2007) that provides an approach of breaking down a collection of faults or defects, as well as a combination of defects that result in other defects. FTA is a logic block analysis represented by a system called the *top event*, which is determined and dependent on its components called the *basic and intermediate events*. This is to say that FTA is a qualitative approach that provides information on the causes of the top event; and a quantitative approach that provides information on the probability of the top event occurring and the importance of the causes (events) of the top event (Vesely *et al.*, 2002). FTA is represented and illustrated graphically with symbols, which indicate the type of events and relationships that exist in the fault tree. Research show that FTA has widely been applied in aircraft systems (Jetter *et al*., 2001; Wong and Yeh, 2007); medical/ health studies (Ndunguru *et al.* 2005; Fujita and Kubo, 2006); automation (Faghri and Egyhaziova, 1999; Zhao *et al.*, 2000); robotics (Khodabandehloo, 1996); nuclear studies (Smith and Schwarzbiat, 1994); software testing (Sohn and Seong, 2004) and satisfaction studies (Yokoyama, 2004).

2.1 Fundamental event symbols in a Fault Tree (FT) used in this study

The basic event symbols used in a fault tree in the scope of this study are:

RECTANGLE event: This is an event that results from a combination of more events. In the context of this study, it is used to represent the participants of the project team.

CIRCLE event: This is an event that cannot be developed any further. It is a basic event and can only occur once. The circle event is used in this study to represent the satisfaction attributes required by the project team.

2.2 Construction of fault tree

The steps for conducting a fault tree analysis include:

2.2.1 Definition of top event

The top event is the event, for which the failure probabilities are defined. It propels the entire analysis. However, some systems require a determination of more than one top event; hence different top events are determined.

2.2.2 Identification of leading and basic event

The identification of the leading and basic events that result in the occurrence of the top event is essential because it provides information on the relative importance of each event.

2.2.3 Qualitative and Quantitative evaluation of fault tree

The qualitative evaluation of fault tree requires identifying the critical events causing the system failure (Chen *et al.*, 2007) known as the minimal cut sets. The minimal cut sets, which define the qualitative results of the top event show the different basic events that lead to the top event. The quantitative evaluation of fault tree requires computing the probability of the events. This entails determining the probability of the top event based on the probability and the importance of the basic events

3 Logical Complement of FT and Satisfaction Evaluation

The FT can be translated into its success tree equivalent, considering that there exists a relationship between success and failure (Vesely *et al., ibid.*). This implies that since the FT basically assumes the occurrence of the top event, consequently, the success tree is concerned with the non-occurrence of the top event. Hence, in the context of this study, given that FT is concerned with the occurrence of dissatisfaction (a failure or fault) of a client or project participant, it implies that the success tree (complement of the FT) will be concerned with the non-occurrence of dissatisfaction, or the occurrence of satisfaction (a success) of the client or project participant. This implies that the FT and success tree identify the minimal sets of basic events that must occur to ensure the occurrence of dissatisfaction and occurrence of satisfaction respectively. Therefore, the success tree identifies the participants that must have their satisfaction attributes met to ensure the occurrence of satisfaction of the participant under consideration.

4 Case Study: Satisfaction Evaluation of the Project Team

The satisfaction of the client and the extent of meeting the client's requirement is evaluated using FTA strategy. The satisfaction evaluation process starts by analysing the rated importance of the time-related satisfaction attributes of the project participants. The time-related satisfaction attributes, used for the scope of this study, comprise the satisfaction attributes that relate to consistency, duration, and instance, as shown in table 1. The attributes form part of the 20 satisfaction attributes generated from the literature and survey reports. The rated importance of the satisfaction attributes as perceived by the project team was generated through a questionnaire analysis. The questionnaire was developed to target three key groups of the construction project team, which are the client group (cg), project management group (pmg), and the supply group (sg). The client group relate to individuals that are the actual initiator and owner of the project,

while the project management group includes the actual participants and workers involved in the construction project. The supply group include participants such as the manufacturer, material and labour suppliers. The questionnaire was distributed to 26 participants representing the afore-mentioned roles (6 designers, 6 engineers, 7 main contractors, 2 project managers, 2 architects, 1 supplier and 2 clients).

Table 1. Time-related satisfaction attributes of project participants

Category of Satisfaction Attribute	Satisfaction Attributes	Symbols for Attributes
	Each phase of the project process is completed on time	$Tsa1_{pmg}$
Time (T)	Communication flow is consistent	$Tsa2_{pmg}$
	Response to complaints, changes/ clarifications is quick	$Tsa3_{pmg}$
	Changes are introduced as early as possible	$Tsa4_{pmg}$
	Ability to meet my deadlines	$Tsa5_{pmg}$
	Project schedules are detailed & easy to understand	$Tsa6_{pmg}$
	Sufficient time is allowed for tender	$Tsa7_{pmg}$
	There exists early involvement of contractor	$Tsa8_{pmg}$
	Communication flow is consistent	$Tsa1_{sg}$
	Project schedules are detailed & easy to understand	$Tsa2_{sg}$
	Changes are introduced as early as possible	$Tsa3_{sg}$

A likert scale of 1-5 was provided for each attribute to note down the respondents' level of importance where 5 was 'strongly agree', 4 was 'agree', 3 was 'somewhat agree', 2 was 'disagree', 1 was 'strongly disagree'. The ratings recorded by the participants for the attributes are shown in table 2. A random selection of the participants' recordings for the attributes is used for the case study.

Table 2. Rated importance for satisfaction attributes of project participants

	$Tsa1_{pmg}$	$Tsa2_{pmg}$	$Tsa3_{pmg}$	$Tsa4_{pmg}$	$Tsa5_{pmg}$	$Tsa6_{pmg}$	$Tsa7_{pmg}$	$Tsa8_{pmg}$
Project Manager		5			5			
Designer	5		5	5				
Structural Engineer		5	4	4		5		
Main Contractor			4	4	5	5	5	5
Sub Contractor		5	5	5		5		
	$Tsa1_{sg}$	$Tsa2_{sg}$	$Tsa3_{sg}$					
Supplier	5	5	5					

The multi-attribute approach was then applied for defining satisfaction scores, importance indices and relative importance indices for the attributes. Multi-attribute method of analysis is considered an appropriate approach required to apply objectivity to satisfaction (Chang and Ive, 2002; Mbachu and Nkado, 2006), by evaluating the satisfaction attributes and allocating weights or values to these attributes in the most objective manner (Nzekwe-Excel *et al.,* 2008).

The importance index of a satisfaction attribute is defined as the sum of the product of the rating point R_a, of an attribute and the percentage response point of the attribute ($PR_a\%$) out of the total number of responses or participants involved in the rating of the attribute. It is mathematically given by:

$$II_{sai} = \sum_{a=1}^{5} R_a \times PR_a\% \qquad (1)$$

where R_a = rating point of attribute; $PR_a\%$ = percentage response to rating point, a
a is the five-point scale used in the questionnaire analysis.

The relative importance of a satisfaction attribute is defined as the importance index of an attribute over the sum of the importance indices of the attributes belonging to a given category (for the scope of this study, the attributes belonging to the time category was used). It is mathematically given by:

$$RII_{sai} = \frac{II_{sai}}{\sum_{i=1}^{N} II_{sai}} \quad (2)$$

The satisfaction score is defined as the product of the importance index and the relative importance index of the attribute. The satisfaction score provides information on the satisfaction derived by a participant based on their perceived importance of the satisfaction attributes and their assessment of other participants. It is mathematically given by:

$$SS = II \times RII_{sai} \quad (3)$$

The relative importance index was primarily used in the satisfaction assessment case study. An illustration of how the indices were generated using the above equations is shown below:

Considering the designer, where there were six of them involved,

Total number of designers, T = 6
Number of designers that rated 5 for Tsa1 = 3 $\Rightarrow$ 50%
Number of designers that rated 4 for Tsa1 = 2 $\Rightarrow$ 33.3%
Number of designers that rated 3 for Tsa1 = 1 $\Rightarrow$ 16.7%
Number of designers that rated 2 for Tsa1 = 0 $\Rightarrow$ 0%
Number of designers that rated 1 for Tsa1 = 0 $\Rightarrow$ 0%

Importance index for Tsa1 is:
II = (5*50/100) + (4*33.3/100) + (3*16.7) + (2*0) + (1*0)
= 2.5 + 1.33 + 0.5 + 0 + 0
= 4.33
Following the same procedure, the sum for the importance indices ($\sum$II) for attributes with respect to designers is 32.502

This indicates that the relative importance index for Tsa1 is:

$$\text{RII} = \frac{II}{\sum II}$$

$$= \frac{4.33}{32.502}$$

= 0.133
Therefore following the same procedure, the relative importance indices of the satisfaction attributes of the participants are derived and shown in table 3.

Table 3. *Relative importance indices (probability values) of satisfaction attributes of project team*

	$Tsa1_{pmg}$	$Tsa2_{pmg}$	$Tsa3_{pmg}$	$Tsa4_{pmg}$	$Tsa5_{pmg}$	$Tsa6_{pmg}$	$Tsa7_{pmg}$	$Tsa8_{pmg}$
Project Manager		0.12			0.12			
Designer	0.13		0.13	0.13				
Structural Engineer		0.14	0.12	0.13		0.13		
Main Contractor			0.12	0.13	0.13	0.13	0.13	0.13
Sub Contractor		0.11	0.14	0.14		0.11		
	$Tsa1_{sg}$	$Tsa2_{sg}$	$Tsa3_{sg}$					
Supplier	0.33	0.33	0.33					

The construction project team considered consists of eight participants each requiring the inputs of one another and their specified satisfaction attributes as shown in figure 1.

The top element (C) defined as the project being completed on time depends on the responsibilities of the project participants as shown on the project tree (fig 1). The project participants represented by the rectangle symbols define the intermediate elements of the process. Subsequently, the time-related satisfaction attributes (requirements) of the participants represented by the circle events define the basic elements of the tree.

The satisfaction relationships between the project participants have been defined using mathematical set operations (union and intersection). The union operation is used to represent all the project participants and/ or satisfaction attributes that are required to satisfy the participant connecting them together; while the intersection operation is used to represent the project participants and/ or satisfaction attributes below the operation that are jointly and mutually required to satisfy the participant connecting them.

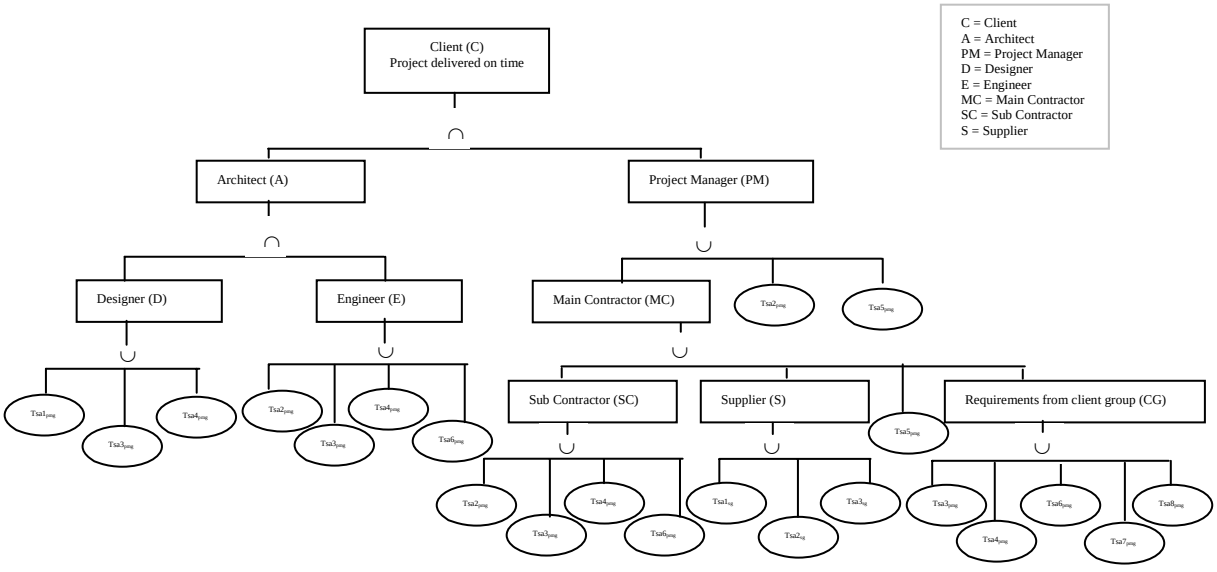

Figure 1. Satisfaction Relationship of Project Team (Project Tree)

Mathematically, the above project tree (fig 1) is represented as:

C = $A \cap PM$

A = $D \cap E$

D = $Tsa1_{pmg} \cup Tsa3_{pmg} \cup Tsa4_{pmg}$

E = $Tsa2_{pmg} \cup Tsa3_{pmg} \cup Tsa4_{pmg} \cup Tsa6_{pmg}$ PM = MC $\cup$ $Tsa2_{pmg} \cup Tsa5_{pmg}$

MC = SC $\cup$ S $\cup$ CG $\cup$ $Tsa5_{pmg}$

SC = $Tsa2_{pmg} \cup Tsa3_{pmg} \cup Tsa4_{pmg} \cup Tsa6_{pmg}$

S = $Tsa1_{sg} \cup Tsa2_{sg} \cup Tsa3_{sg}$

CG = $Tsa3_{pmg} \cup Tsa4_{pmg} \cup Tsa6_{pmg} \cup Tsa7_{pmg} \cup Tsa8_{pmg}$

Applying Boolean Laws expressions, the tree becomes:

C = A . PM

A = D . E

D = $Tsa1_{pmg}$ + $Tsa3_{pmg}$ + $Tsa4_{pmg}$

E = $Tsa2_{pmg}$ + $Tsa3_{pmg}$ + $Tsa4_{pmg}$ + $Tsa6_{pmg}$

PM = MC + $Tsa2_{pmg}$ + $Tsa5_{pmg}$

MC = SC + S + CG + $Tsa5_{pmg}$

SC = $Tsa2_{pmg}$ + $Tsa3_{pmg}$ + $Tsa4_{pmg}$ + $Tsa6_{pmg}$

S = $Tsa1_{sg}$ + $Tsa2_{sg}$ + $Tsa3_{sg}$

CG = $Tsa3_{pmg}$ + $Tsa4_{pmg}$ + $Tsa6_{pmg}$ + $Tsa7_{pmg}$ + $Tsa8_{pmg}$

Applying Probability laws,

The probability evaluations for the union (+) and intersection (.) mathematical operations are respectively:

$$P^{+} = 1 - \prod_{i=1}^{n}\{1 - P_i\} \qquad (2)$$

where: P^{+} is the union output event, n is the total number of input events,

P_i is the probability of occurrence of the union input event P_i, for i = 1,2,3,…,n

$$P^{\bullet} = \prod_{i=1}^{n} P_i \qquad (3)$$

where: $P^{\bullet}$ is the intersection output event, n is the total number of input events,

P_i is the probability of occurrence of the intersection input event P_i, for i = 1,2,3,…,n

Hence, the probability representations for the above Boolean expressions become:

P(C) = P[A . PM] = P[A] . P[PM] = $\prod_{i=1}^{n} P_i$

P(A) = P[D . E] = P[D] . P[E] = $\prod_{i=1}^{n} P_i$

P(D) = P[$Tsa1_{pmg}$ + $Tsa3_{pmg}$ + $Tsa4_{pmg}$] = 1 - $\prod_{i=1}^{n}\{1 - P(T_{sai})\}, i = 1,3,4$

P(E) = P[$Tsa2_{pmg}$ + $Tsa3_{pmg}$ + $Tsa4_{pmg}$ + $Tsa6_{pmg}$] = 1 - $\prod_{i=2}^{n}\{1 - P(T_{sai})\}, i = 2,3,4,6$

P(PM) = P[MC + $Tsa2_{pmg}$ + $Tsa5_{pmg}$] = 1 - $\prod_{i=1}^{n}\{1 - P(T_{sai})\}$

P(MC) = P[SC + S + CG + $Tsa5_{pmg}$] = 1 - $\prod_{i=1}^{n}\{1 - P(T_{sai})\}$

$P(SC) = P[Tsa2_{pmg} + Tsa3_{pmg} + Tsa4_{pmg} + Tsa6_{pmg}] = 1 - \prod_{i=2}^{n}\{1-P(T_{sai})\}, i = 2,3,4,6$

$P(S) = P[Tsa1_{sg} + Tsa2_{sg} + Tsa3_{sg}] = 1 - \prod_{i=1}^{3}\{1-P(T_{sai})\}$

$P(CG) = P[Tsa3_{pmg} + Tsa4_{pmg} + Tsa6_{pmg} + Tsa7_{pmg} + Tsa8_{pmg}] = 1 - \prod_{i=3}^{8}\{1-P(T_{sai})\}$

As a means to evaluate the probability of meeting the satisfaction attribute of the client, the probabilities of satisfying the project participants are first established. These however depend on the probabilities of the satisfaction attributes of the participants. The relative importance indices derived from the use of the multi-attribute approach define the probabilities of the attributes (table 3).

Therefore to weigh the impact of the satisfaction of the project participants (by meeting their satisfaction attributes) on the satisfaction of the client, the quantitative evaluation of the project tree (fig 1) is carried out.

Hence the quantitative evaluations of the project tree are presented below:

$P(CG) = 1 - \prod_{i=3}^{8}\{1-P(T_{sai})\}$

$= 1 - \{[1-P(Tsa3_{pmg})][1-P(Tsa4_{pmg})][1-P(Tsa6_{pmg})][1-P(Tsa7_{pmg})][1-P(Tsa8_{pmg})\}$

$= 1 - [1-0.12][1-0.13][1-0.13][1-0.13[1-0.13]$

$= 0.4959$

Similarly, the probability values for the project participants are:

P(S) = 0.6992
P(SC) = 0.4142
P(MC) = 0.9227
P(PM) = 0.9404
P(E) = 0.4272
P(D) = 0.3415
P(A) = 0.1459
P(C) = P[A] . P[PM]
= 0.1372 ≈ 0.14

5 Results from Tree Analysis and Further Analyses

The top or initiating element in the project tree (fig 1) defined as the project being delivered on time is a satisfaction attribute of the client. The tree shows that the client specifies the satisfaction attribute to the project manager and architect. For the project manager (PM) to meet the client's requirement, PM requires inputs from the main contractor (MC), a satisfaction attribute ($Tsa2_{pmg}$) from the client and another attribute ($Tsa5_{pmg}$) from MC. However, MC requires inputs from the sub contractor (SC) and supplier (S), satisfaction attributes from these subordinates ($Tsa5_{pmg}$), as well as satisfaction attributes from PM (CG: $Tsa3_{pmg}$, $Tsa4_{pmg}$, $Tsa6_{pmg}$, $Tsa7_{pmg}$, $Tsa8_{pmg}$) in order to meet the requirement of PM. Subsequently fig 1 shows that the architect (A) requires the inputs of the designer (D) and engineer (E), who define their satisfaction attributes as

shown, to meet the client's satisfaction attribute (top element). The same procedure follows for the SC and S as shown in the figure. This implies that for the supplier (S) to meet the satisfaction attributes ($Tsa5_{pmg}$) of MC, the supplier's satisfaction attributes ($Tsa1_{sg}$, $Tsa2_{sg}$, $Tsa3_{sg}$) need to be met by MC.

Results from the tree analysis indicate that there is 14% chance that the client will be satisfied by the project being completed on time.

It was however observed that if the relative importance indices for the attributes were to be lower than required by the project participants as shown in table 4, the quantitative evaluation (below) reveal that the chances of completing the project on time (top element) as required by the client is reduced from 14% to 12%.

Also, considering different sections of the project tree, the following points are observed:

- Considering the project manager as the top element, the analyses show that where the relative importance indices for the participants (main contractor, sub contractor, and supplier) are reduced, it invariably reduces the probability of satisfying the project manager from 0.9404 to 0.9310.
- Considering the architect as the top element, the results also reveal that the probability to satisfy the architect is significantly reduced from 0.1459 to 0.1307 if the relative importance indices of the satisfaction attributes for the designer and engineer are reduced.

Table 4. Adjusted relative importance indices (probability values) of satisfaction attributes

	$Tsa1_{pmg}$	$Tsa2_{pmg}$	$Tsa3_{pmg}$	$Tsa4_{pmg}$	$Tsa5_{pmg}$	$Tsa6_{pmg}$	$Tsa7_{pmg}$	$Tsa8_{pmg}$
Project Manager		0.10			0.12			
Designer	0.13		0.11	0.13				
Structural Engineer		0.14	0.12	0.11		0.11		
Main Contractor			0.12	0.13	0.11	0.13	0.11	0.13
Sub Contractor		0.11	0.12	0.14		0.09		
	$Tsa1_{sg}$	$Tsa2_{sg}$	$Tsa3_{sg}$					
Supplier	0.33	0.31	0.33					

$$P(CG) = 1 - \prod_{i=3}^{8}\{1 - P(T_{sai})\}$$

$$= 1 - [1\text{-}0.12][1\text{-}0.13][1\text{-}0.13][1\text{-}0.11[1\text{-}0.13]$$

$$= 0.4843$$

Similarly the new probability values for the participants are:

P(S) = 0.6903
P(SC) = 0.3871
P(MC) = 0.9129
P(PM) = 0.9310
P(E) = 0.4005
P(D) = 0.3264
P(A) = 0.1307
P(C) = 0.1217 ≈ 0.12

Hence there is 12% chance that the client would be satisfied by the project being completed on time

6 Conclusions

The likelihood of meeting the satisfaction attribute or satisfaction level of the project participant under consideration, known as the *top element,* can be derived and calculated from the probabilities of the satisfaction attributes of the participants that lead to the *top element*. The fault tree analysis strategy applied in the project team helps to determine the effects of combinations of the satisfaction attributes of the project participants on the satisfaction of a particular participant under consideration, example the client.

The above results and quantitative evaluation of the project tree reveal that the satisfaction of participants at the lower level of the project tree has a positive and significant impact on the satisfaction level of participants on higher levels of the project tree. Hence, where the probability to satisfy the other participants (meeting their satisfaction attributes) is high, it invariably improves the chances of meeting the client's requirements.

The case study further showed that when focus is placed on the satisfaction attributes of other project participants besides the client, it enables the participants to settle in and integrate more with one another, thereby creating better chances on meeting the requirements of the clients and ensuring their satisfaction.

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Optimising healthcare facility value through better briefing and optioneering

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Abstract:
There have been concerns over the capability of most National Health Service (NHS) hospitals to demonstrate best value in providing non-clinical service to NHS trust customers. In response to the need to demonstrate the Whole Life Value (WLV) of healthcare facilities, the briefing and project optioneering processes need to be tackled. This paper investigates the role of strategic briefing and optioneering (option selection) in creating and delivering WLV for both first and future generation stakeholders. Effective construction briefing relies on, among others, effective capture, analysis and use of information (needs and requirements) from all stakeholders to inform project options. It is also believed that project and facility strategy must be directly linked with the specific needs and requirements (among other things) in order to reflect exactly what the stakeholders and end-users value in a built environment. The paper reviews the underlying philosophies and attempts to make sense of a probable theoretical linkage between the three concepts: WLV, strategic briefing and optioneering. Building on the available literature, the paper introduces a research in progress which is reviewing WLV of healthcare facilities and how to improve it. The results from WLV and briefing literature are pointing towards the early involvement of stakeholders, including end-users as a way forward to achieving long-lasting value.

Keywords:
NHS, optioneering, stakeholders, strategic briefing, value-optimisation

1 Introduction

The sixty year old National Health Service (NHS) is at the centre of UK healthcare. Since its inception, and most especially in the past decade, the NHS has experienced social, economic and technological change as well as political (administrative and government policy) change (Hackney *et al*., 1997; HPERU, 2008). Recent changes, combined with Britain's consumerist society (Douglas *et al*., 2003) have further increased the level of awareness amongst the public and NHS stakeholders (Glanville, 2003). Some recent reforms in the NHS that reflect stakeholder awareness are the *'Strengthening accountability - involving patients and the public'* (DH, 2003b) and the '*Patient and Public Involvement*' (PPI) initiatives (DH, 2008). These organisational changes compounded by other national and global agendas like 'Value for Money'

(VfM) (Building, 2000; Saxon, 2005) and sustainability (WCED, 1987) imply that planning of hospital buildings now has to respond accordingly to the changes.

It is argued that the planning of hospitals has all the problems associated with the planning of other buildings types and more (Goodman, 1972). The basis of this argument is that functioning parts of hospitals are complex, the environmental services (electro-mechanical) are critical while changes in medical and nursing management techniques are considerable and unpredictable. Moreover, by virtue of the medical technological functions carried out inside them, healthcare buildings or hospitals are usually complex, specialised, purpose-made buildings.

This paper presents a theoretical account seeking to establish whether a linkage exists between WLV of healthcare buildings, strategic briefing and option selection as seen in the early stages of project formulation (Stage A, RIBA Plan of work , 2007). Based on a review of relevant literature, the account is founded on the premise that WLV for a facility 'owner-occupier', in this case NHS, is tightly knit with the satisfaction delivered to the healthcare facility end-users through sustained use across the facility's whole life (Bordass and Leaman, 1997; Holt, 2001; Vischer, 2008). The most fundamental aspect is the *use value* of the facility; the core of our research project. The paper begins with providing the background and rationale for the research, followed by theory on the concepts of WLV, strategic briefing, and optioneering. Overarching findings from literature are presented. The paper closes with a conclusion indicating the advantages of having a conscientious value strategy contributed to by stakeholders, and laid out in the early stages of briefing and optioneering processes. It is hoped that, a balanced solution capable of standing the test of time while simultaneously being satisfactory to the users of the facility over its design life, will result from this strategy thereby enhancing WLV.

2.1 Research background and justification

One key issue arising from the recent healthcare sector dynamics is the issue of stakeholder engagement. Specifically, the PPI initiative (DH, 2008) is a direct reflection of the Government's commitment to empowering both individuals and communities so that they can play a greater role in shaping health and social care services that affect them. Treasury Procurement No.7 (OGC, 2003) mandates that all public sector construction must be procured based on VfM in terms of the optimum combination of whole life costs and quality which meet stakeholder requirements. VfM when corroborated with 'public value' (Kelly *et al*., 2002; Albert and Passmore, 2008) and PPI leads to the necessity for accountable decision-making and public involvement in the process of acquisition of public sector capital assets.

Against a backdrop of all the aforementioned complexities, the current Government is undertaking a multi-billion pound hospital building programme, the largest in the history of the NHS (DH, 2007). When central government, through the NHS, embarks on such a building programme, huge sums of money are at stake. Moreover, from the large sums of money invested in buildings, clients hope to maximise the value they obtain (Best and de Valence, 1999). Literature on construction briefing reveals that most decisions that will impact the rest of the facility's life are made here (for example Goodacre *et al.,* 1982; Duerk, 1993; Kelly *et al.,* 2003).

For these reasons, briefing and early option selection for healthcare buildings have to be carefully thought out. The challenge for the NHS and the construction industry (as suppliers of buildings) is to discount concerns regarding the inability of the NHS to obtain VfM when procuring healthcare facilities (NAO, 2001). Notably: investment decisions based on lowest initial capital investment and not whole life costs; in addition to, the inability to manage the early stages of projects to ensure that users are properly engaged in the process to avoid later changes to the functional requirements for healthcare facilities.

Achieving WLV as well as better management of the pre-design stages to yield better engagement with users of healthcare facilities is central to the research project of which this paper is part. The basic hypothesis for this descriptive exploratory study is that 'achieving better WLV of healthcare buildings can be realized through better understanding of the needs and requirements of the end-user stakeholders. WLV is believed to accrue from making the right decision(s) at the right time when faced with competing or multiple alternatives. As noted above, healthcare building-related decisions are based on balancing competing issues of: what stakeholders need, efficient use of limited resources and a myriad external issues, in order to achieve a "best" solution. This is what optimising healthcare facility value is about. The premise for the need to optimise this value is based on Tam and Price's (2008) definition of optimisation in which they posit that optimisation involves finding the best results for an objective with given restraints and relationships.

2 Literature Review

2.2 Briefing

There have been calls on the UK construction industry to devote more effort and resources to, definition and articulation of project requirements, and to understanding the client's needs (Banwell, 1964; Latham, 1994). Sir John Egan (1998) called on the industry to focus more on the customer [either the client or the consumer] and on systematic research on what the end-user actually wants. In the subsequent *'Accelerating Change'* report (Egan, 2002), the forum suggested to the construction industry a need to be characterised by a process that helps clients describe their needs so that as a minimum, the project delivers their requirements thereby realising maximum value for all clients (end-users and stakeholders).

Client needs and requirements play a vital role in decision making and option selection since they are the basis upon which clients will judge their satisfaction with project outcomes. As O'Reilly (1987) notes, defining client requirements as well as communicating them to other stakeholders are key to the successful delivery of a project. This is because, defined requirements will lead to defined objectives which will provide a basis for appraisal as well as help identify available building and organisational options. Hence, in order to ensure that client needs are met and satisfied, it is important that they are understood right from the onset and always referred to in the project development process.

In the construction industry, client's needs and requirements are normally presented in form of a 'brief' document produced as an output to the briefing process. Briefing (architectural programming in the USA and some other countries) is the process through which client requirements are identified and defined, and through which others are informed of client needs, aspirations and desires for a project (CIB, 1997). Pena and Parshall (2001:14) view it as "a process leading to the statement of an architectural problem and the requirements to be met in offering a solution". Blyth and Worthington (2001:3) define it as "the process by which options are reviewed and requirements articulated with the 'brief' as the product of that process" as well as an evolutionary process of understanding an organisation's needs and resources and matching these to its objective and its mission. In summary, the process involves gathering, analysing and synthesising information needed in the building process and using it to inform decision-making and decision implementation (Kelly, 2002).

Briefing is the first tangible step in any facility's life-cycle. It is one of the most important since it sets the agenda for the remainder of the facility's life-cycle right from inception through to completion and use/operation even perhaps its disposal. There has been considerable research and guidance for improving the construction briefing process in the industry (for example Goodacre *et al*., 1982; Duerk, 1993; ISO 9699:1994/BS 7832:1995; Salisbury, 1998; Pena and Parshall, 2001). For healthcare projects, briefing and design guidance has come in the form of notes and standards, for example, Health Building Notes (HBN) series; the Best Client Manual (NHS Estates, 2002), AEDET Evolution (2008); and, ASPECT (2008). Despite all this the briefing process generally remains problematic and inadequate (Kelly *et al*., 2003; Shen, 2004).

Some recent ideologies for improving the briefing process are of interest in this paper. These include the proactive involvement of all stakeholders (Barrett and Stanley, 1999), and, less concern with detail at an early stage but more with articulating client aspirations and stimulating the design team by providing relevant information at the appropriate stage of the project (Blyth and Worthington, 2001).

2.3 The client organisation

Usually, when the construction industry refers to 'the client' a sense of singular-identity hides an over-simplified complexity of internal structures and processes (Tavistock Institute, 1996 cited Woodhead, 2000). This is exemplified in Kamara *et al*.'s (2002:2) definition of clients' roles as "the initiators and the financiers of projects". Nevertheless, it is increasingly being recognised that a client is not necessarily one single point of contact. In fact for organisations like the NHS, clients are often multi-faceted in nature, comprising several different interest groups or stakeholders (Figure 1), whose objectives and expectations differ, and may well be in conflict (Green, 1996).

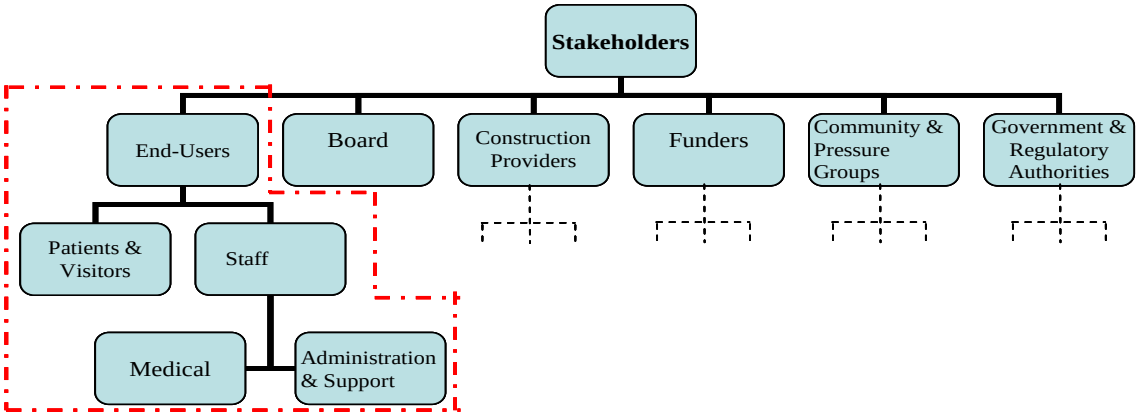

Figure 1: Healthcare facility stakeholders

Recent briefing research advocates for recognising the needs and requirements of end-users as early as possible in the project process (Pena and Parshall, 2001; Barrett and Stanley, 1999; Blyth and Worthington, 2001). In recognising the plurality of the NHS as a client organisation, this paper supports this recent development. However, the challenge of engaging early with stakeholders (end-users) not only on construction projects (Boyd and Chinyio, 2006; Emmitt, 2007) but elsewhere too (Earl and Clift, 1999; Stoyell *et al*., 2001; Ulrich and Eppinger, 2001) has been raised before. But Pena and Parshall (2001) perceive that end-users, unlike any other stakeholder group, are experts in the use of the building therefore their needs should be fully researched and they should be contributing members of the project team. Ridley and Jones (2002:6-7) further suggest that "ideally, users should be involved from the earliest stages of planning as this offers the best chance that more responsive and user-led services will be developed". Implicitly, the best opportunity to ensure that the right building is built can result from engaging directly with the end-users at the point of 'appraisal of need' (Stage A, RIBA Plan of work, 2007) during the briefing process.

2.4 Strategic briefing

The briefing process comprises two stages: 'strategic (initial) briefing' and 'project (detailed) briefing' (CIB, 1997; Kelly, 2002; Kamara *et al.*, 2002). A strategic brief is formulated at the end of the pre-project phase upon concluding the project option selection (optioneering) process (Figure 2) but before formulating the detailed project brief. Strategic briefing takes a 'long-term' view of the project and considers both the 'short-term' project needs as well as the operational needs of the completed facility. It takes a whole life view of the facility. Ryd and Fristedt (2007:186) perceive that "strategic briefing springs from the current operational needs, but also takes a longer perspective and focuses on the operation's strategic development plans, its prospects, and the building's potential for adaptation for other uses".

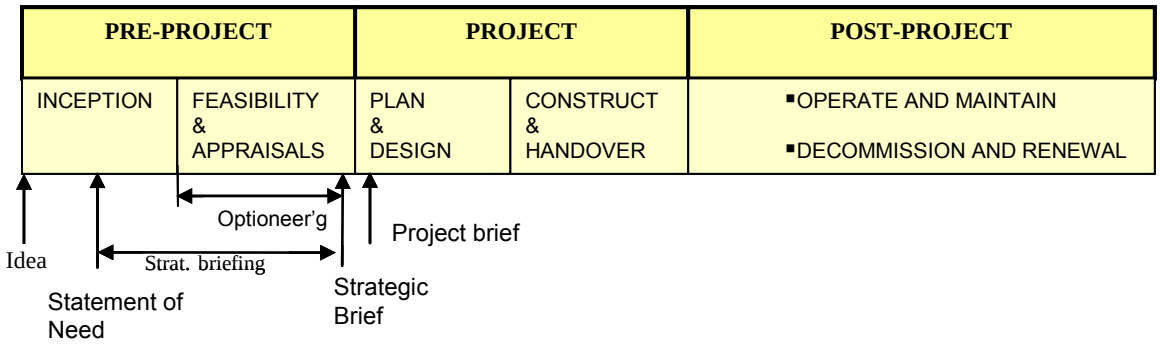

Figure 2: Whole Life cycle depicting key points in the early stages

2.5 Strategy

Johnson *et al.* (2008:3) define strategy as "the *direction* and scope of an organisation over the long term, which takes *advantage* in a changing *environment* through its configuration of *resources* and *competences* with the aim of fulfilling stakeholder expectations". They further posit that strategy and strategic decisions are associated with such issues as the long-term direction of an organisation expresses in terms of the organisation's mission. Accordingly, Mintzberg *et al*., (2004) are of the view that strategy is the pattern that links the organisation's major goals, policies and actions into a cohesive whole. Inferring from these definitions, every undertaking (action) including facility acquisition (design and construction) should have a specific strategy.

2.6 Linking strategy and strategic briefing

It is only those healthcare facilities that can attract many patients that will be able to survive competition. The '*Patient Choice*' initiative (DH, 2004) and the '*Payment by Results*' (PbR) - (money follows patient') scheme (DH, 2003a), are leading to a trend whereby hospitals no longer choose patients, patients choose hospitals (Miller and May, 2006). This implies that the NHS is increasingly becoming a competitive organisation. Consequently, in order to improve the services that attract patients and staff, it is now even more important than ever that healthcare organisations consult early with the facility and service-users about what they value in the built environment. That way the information generated from the consultation (through the strategic briefing process) can be used to guide decision-making especially in defining overarching facility-design and procurement strategies over the long term.

Recent studies are increasingly associating healthcare built environments with patient and staff well-being (Malkin, 2003; Lawson and Phiri, 2003). In addition, the role of buildings in supporting other key organisational resources has been highlighted before (Bordass and Leaman, 1997; Nutt, 2004). Therefore, a conscientious strategy for healthcare facility procurement to meet long-term survival needs as well as the needs of the users (patients and staff) is very pertinent. Such a strategy is what strategic briefing is about. The very essence of a strategic approach being decision-making in changing, uncertain, unpredictable and competitive circumstances (Nutt, 2000).

2.7 Optioneering

The early stages of construction projects, and indeed, most other projects, are characterised by making critical decisions (Duerk, 1993; Agouridas, 2006; Bruce and Cooper, 2000). Optioneering involves making high level decisions which normally affect the success or failure of the whole ensuing life-cycle of the facility. Some decision issues identified from literature (for example Nutt, 1993; Woodhead, 2000; Standing, 2001) are presented in Figure 3. Decision-making involves selecting between alternatives. It may therefore rightly be deduced that optioneering (option-selection) is about the key issue of decision-making. However, Barton and Pretorius (2004) note that most economic decision-making is about the application of limited resources. Also, most buildings have a unique permanency resulting from both their physical fixity and their often long design lives therefore making it paramount that optioneering is done 'right first time' (Crosby, 1979). Moreover, it has been noted that, problems in buildings (Smith *et al.*, 2001; Shen *et al*., 2004); costliest mistakes (Duerk, 1993); and the making of a pyramid of decisions regarding setting the scope and characteristics of the project (Kelly, 2002), are associated with the briefing (optioneering) stage.

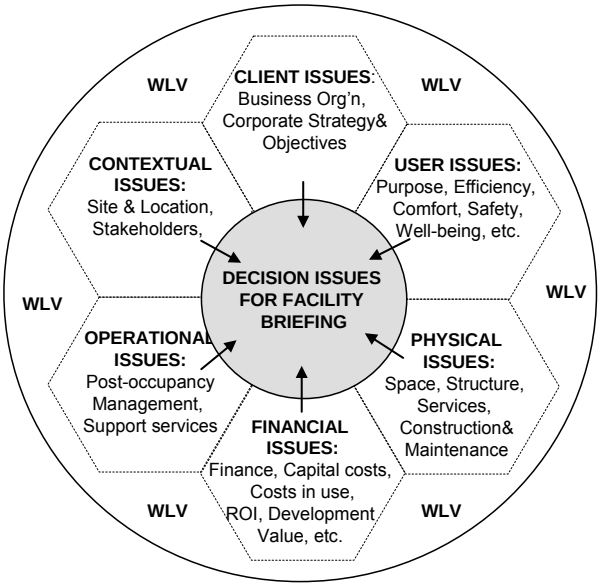

Figure 3: Decision issues for facility briefing and optioneering

Optioneering encompasses the processes of selecting an optimum solution that best meets the needs and requirements of stakeholders. It is a dominant and crucial aspect of the pre-project phase (Stage A, RIBA plan of work, 2007). Optioneering is conducted simultaneously with strategic briefing of the construction briefing process (Figure 2). It is advised that before committing to strategic project direction the client team (including stakeholders) review the possibilities, evaluate them and then make a decision that can be documented (Smith and Jackson, 2000). This is the basis of the optioneering process.

2.8 Whole Life Value (WLV)

WLV of an asset represents the optimum balance of stakeholders aspirations, needs and requirements, and whole life costs (Bourke *et al*., 2005). It encompasses economic, social and environmental aspects associated with design, construction, operation and decommissioning, and where necessary the re-use of the asset or its component parts at the end of its useful life (Bourke *et al*., 2005; Mootanah, 2005). A WLV approach considers planning of a facility through a WLC approach – from 'cradle to grave'. This approach embodies the need to make decisions based on WLV thereby requiring an optimum balance of stakeholder aspirations, needs and requirements, whole life costs, (Bouchlaghem *et al*., 2000; Bourke *et al*., 2005) as well as, contextual social and environmental aspects associated with a specific project.

3 Findings and Discussion

There is substantial work published on briefing most especially in the form of guidance and checklists. However, there is less that focuses on value delivery in relation to strategic briefing nor to options selected in the pre-design stages. Neither is there much information on issues raised and concepts used when selecting project options (solutions) in the pre-design stages. Shen (2006) has noted that to date, problems of traceability of requirements, identification of stakeholders and management of potentially conflicting requirements during briefing remain unresolved in current practice. Moreover, it has been noted by Earl and Clift (1999) that complex investment decisions are increasingly being created and made emotive by a plethora of stakeholder expectations. The solution to this conundrum may lie in the timing of the requirements acquisition and in when stakeholders are actually engaged in the process. Early engagement (before design) and investigation into the real needs of stakeholders especially the end-users may provide the answer.

Conversely, it is important that the right decision choices are made at the right time. This is so because the cost of construction, operation and maintenance of buildings, especially specialised healthcare buildings, is very high. Previous sections have shown that the most important decisions are made in the briefing stage. It has been found that currently a capital paradigm (initial capital cost) dominates the pre-project stage, and is the main influence on the structure and sequence of analysis, considerations and decisions in construction projects (Woodhead, 2000; Mootanah, 2005).

Furthermore, the project life cycle has traditionally been considered to start at inception and end at feedback after completion, exemplified by RIBA plan of work (1997). But a new paradigm is emerging which requires that a whole life cycle (WLC) approach is taken when planning facilities. Some proponents of this approach are of the view that unlike traditional approaches, it focuses on the front-end activities of identification, definition and evaluation of client requirements in order to identify suitable solutions (Kagioglou *et al*., 2000). Previously, pursuance of a WLC approach has been based on economic grounds based upon comparing low initial capital costs, to the high cost of running and maintaining a facility over its (long) useful life (for example OGC, 2003;

Kishk *et al*., 2003). This view has further been enhanced by the Royal Academy of Engineering (RAE) 1:5:200 (capital:maintenance:operating) ratio (Evans *et al*., 1998).

Further to the WLC approach, the need to attain WLV has emerged. A WLV approach demonstrates that there is more to the whole life approach than cost or economic value. It takes a broader view of the issues surrounding a building project taking into consideration environmental, social as well as economic issues. Consequently, WLV influences the way decisions are made during the pre-project phase further broadening the issues that must be considered when selecting best options. Because the breadth of issues to consider when making a decision has increased, thorough problem analysis may lead to not pursuing a construction project at all (Smith and Love, 2004).

Previous research (Goodacre *et al*., 1982) has revealed that clients do not invest sufficient time and resources in the early stages. Smith and Jackson (2000) agree that, the identification of strategic needs of clients is a significant stage in the development process. Also that, if the strategic analysis of needs has been rigorously and conscientiously pursued, then it should result in a clear view of organisational goals, a better definition of real needs and the strategic decision should recommend the best means. Rigour and conscientious pursuance may spell more resources needed. A strategic briefing exercise involving engaging stakeholders and the various end-user groups of NHS facilities may indeed be resource-intensive. Even so, the benefits have been seen in the previous sections of this paper. Therefore, it is worthwhile spending some more time and money in the early project definition stages if only to accrue savings in the long term.

4 Conclusion and Further Research

Most of the past construction briefing research work has focused on project briefing sub-process. In this paper, focus is towards strategic briefing. Like Smith and Jackson's (2000) work on Strategic Needs Analysis (SNA), it is hoped that renewed emphasis on strategic briefing will change the client's frame of reference in defining projects during the pre-project phase. By focusing on the strategic briefing stage, it is envisaged that the client organisation (in this case NHS) will no longer look to prescriptive and standard responses, rather, that it will look out for a strategic view of their own organisation's true goals, objectives, needs and requirements (Smith and Jackson, 2000).

The most opportune stage in which to investigate, capture and account for value in a project is during the strategic briefing stage. It is believed that value attained and appreciated by the end-users is not a coincidence but a conscious effort accorded to embedding it during the delivery process. It is suggested that the strategic briefing stage be the centre of focus for eliminating probable and envisaged problems associated with project failure. By exploring and seeking to fix these problems at the earliest point in the project's life cycle, it will be a successful way to add value. Furthermore, strategic briefing offers an opportunity for total focus on the rationale of the construction project. By definition, a strategy provides a requirement to look farther than today (avoiding short-term fixes), into the future when dealing with the needs and requirements of

stakeholders thereby offering a sustainable way for planning cost-intensive built healthcare facilities for both the present and future needs of the end-users.

The next step in this research will be to empirically ascertain briefing and optioneering best practice within NHS projects. Briefing is a process which is difficult to discuss in abstract and for this reason a case study approach would seem most appropriate (Hudson *et al*., 1990). Results from this and on-going literature survey are pointing towards questions such as: what is the general understanding of WLV, briefing and optioneering for NHS construction projects? How are the processes carried out and what drives the decision-making? Who are the key participants and what is the current state of end-user engagement in the pre-design stages? What features of the dynamic health built environment would reflect long lasting value (WLV) to the healthcare stakeholders? Further work in the research will also seek to see how to make best use of the existing NHS briefing and option selection tools like AEDET Evolution (2008); ASPECT (2008); and others in order to enhance what is already available and to an extent avoid 're-inventing the wheel'.

The on-going research into improving WLV through focusing on strategic briefing and optioneering is hoped to bring about a better understanding of WLV and how to improve it. It seeks to improve methodology for early investigation and identification of the real client needs, for both current and future use. The research advocates for understanding the NHS as a client organisation in terms of the context of its people (stakeholder groups), as well as the purpose of its existence (business function) that corresponds with the life of the facility in-use (end-use related issues). It is hoped, the result of this fundamental understanding should lead to decisions that match resources expended and the 'best' or optimum solution derived upon balancing conflicting issues that impact facility design, production, use, re-use and disposal. Hence through-life value-optimisation.

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Prioritisation of Factors That Affect the Housing Industry: Interpretive Structural Model (ISM)

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Abstract

For long time, the housing industry in the developing world has suffered from underinvestment, the lack of knowhow and the lack of sufficient strategies and policies. This in turn, led to a total failure in performance, accumulative massive housing demand and underachieving. Consequently, and because of the massive growth in the world's population, people in the poorest countries have been the most affected and forced to live in slums and shanty towns which some worldwide have millions of occupants. This research paper focuses on identifying, classifying and prioritising variable of the housing industry as part of strategy setting and implementing. These variables are such as Regulation & Legislations, Finance, Types of Projects, Know How, Foreign Know How, Private Sector (SMEs), Training, Construction Method, Building Materials, Labour, Foreign Labour, Land and Design. Interpretive Structural Model (ISM) will be adopted and used as a tool to prioritise these variables to assist decision makers in setting successful and sufficient strategies and policies and as a guide to emphasise the starting point. According to literature, ISM has been successfully implemented so far in Energy Conservation in Indian, Cement Industry, Vendor Selection, Waste Management in India, Knowledge Management in Manufacturing, Productivity Improvement in Reverse Logistics, IT-enabled Supply Chain, Modelling the Agility of Supply Chain and Modelling the Logistics Outsourcing Relationship Variables. However, ISM has never been adopted and for the housing industry. The research methodology will consist of two parts; literature review which shed light on ISM in terms of definition, stages, purposes, mechanism, how it functions, etc. The second will identify, classify and characterise the housing industry variables using Entity Relation Model. Finally, the ISM will be examined and tested using the identified housing industry variables. The findings will be stated in the concluding section.

Keywords: Housing Industry, Housing Industry Factors, Interpretive Structural Model (ISM)

1. Introduction

For long time, the housing industry in the developing world has suffered from underinvestment, the lack of knowhow and the lack of sufficient strategies and policies. This in turn, led to a total failure in performance, accumulative massive housing demand and underachieving. Consequently, and because of the massive growth in the

world's population, people in the poorest countries have been the most affected and forced to live in slums and shanty towns which some worldwide have millions of occupants.

One of the tools available to assist decision-makers in setting sound strategies and policies is Interpretive Structural Model (ISM). Interpretive Structural Modelling (ISM) was first introduced by J. Warfield in 1973 to analyse the complex socioeconomic systems. ISM is a computer-assisted learning process that enables individuals or groups to develop a map of the complex relationships between the many elements/variables involved in a complex situation (Gorvett and Liu, 2006). The Model, then, have been developed and evolved into a statistical and mathematical model. ISM implication is entirely dependent on two important factors. The first is the use of assumed contextual and logical relationships between variables according to four major possible assumptions a relationship could fall into. The second is to structure an ISM matrix upon the assumed relationships.
The main objectives of this study are as follows:

1. to investigates methods to identify and rank variables and criteria,
2. to find out the interaction among identified variables and criteria using ISM, and
3. to discuss the managerial implications and decision-making process within using ISM.

This research paper focuses on identifying, classifying and prioritising variable of the housing industry as part of strategy setting and implementing. These variables are such as Regulation & Legislations, Finance, Types of Projects, Know How, Foreign Know How, Private Sector (SMEs), Training, Construction Method, Building Materials, Labour, Foreign Labour, Land and Design. Interpretive Structural Model (ISM) will be adopted and used as a tool to prioritise these variables to assist decision makers in setting successful and sufficient strategies and policies and as a guide to emphasise the starting point. According to literature, ISM has been successfully implemented so far in Energy Conservation in Indian, Cement Industry, Vendor Selection, Waste Management in India, Knowledge Management in Manufacturing, Productivity Improvement in Reverse Logistics, IT-enabled Supply Chain, Modelling the Agility of Supply Chain and Modelling the Logistics Outsourcing Relationship Variables. However, ISM has never been adopted and used for the housing industry.

The research methodology will consist of two parts; literature review which shed light on ISM in terms of definition, stages, purposes, mechanism, how it functions, etc. The second will identify, classify and characterise the housing industry variables using Entity Relation Model. Finally, the ISM will be examined and tested using the identified housing industry variables. The findings will be stated in the concluding section.

2. Definition

Warfield (1973) defines Interpretive Structural Modelling (ISM) as a computer-assisted learning process that enables individuals or groups to develop a map of complex relationships among many elements involved in a complex situation. Duperrin and Godet (1973) suggest that ISM is primarily intended as a group learning process. The method is interpretive as the judgment of the group decides whether and how the

variables are related. Ravi and Shankar (2004) believe that the methodology of ISM is an interactive learning process. It is a set of different and directly related variables affecting the system under consideration and is structured into a comprehensive systemic model. The benefit of ISM model is that it reveals the structure of a complex issue of a problem under study, in a carefully designed pattern employing contextual and logical interpretations, matrices, graphics tables, etc. The methodology of ISM can act as a tool for imposing order and direction on the complexity of relationships among elements of a system. Qureshi *et al,* (2007) argue that ISM is a method which enables handling the complexity of the system and resolves it into easily comprehendible form by working out the hierarchical arrangement of system variables. Thus, ISM is structured on the basis of relationships, and the overall structure is extracted from the complex set of variables. In other words, ISM is a modelling technique where the specific relationships and overall structure is represented in matrices, digraphs MICMAC model, etc.

Gorvett and Liu (2006) suggest that ISM was first proposed to use experts' practical experience and knowledge to simplify a complicated system into several sub-systems (elements) and construct a multilevel structural model. Moreover, Bolaños and Nenclares (2005) claim that ISM is an advanced interactive planning methodology that allows a group of people, working as a team, to develop a structure that defines the relationships among elements and variables in a set. In other words, it is safe to say that ISM is a model based on logical and contextual interpretation of the relationships among variables and used to provide fundamental understanding of complex situations, as well as to put together a group of actions for solving a problem. The ISM procedure can be described briefly as a process is used to peritonising variables according to their contextual relationships.

3. ISM's Scope

In this section; a displaying list of industries and sectors applied the ISM model to identify variables, prioritising them and solve problems. Qureshi *et al,* (2007) suggest that the Table 1 (see appendix) illustrates the types of industries that applied the ISM model.
According to Table 1, Saxena *et al* (1990) applied the ISM methodology to the case of Energy Conservation in Indian Cement Industry and identified the key variables using direct as well as indirect interrelationships amongst the variables. Mandal and Deshmukh (1994) used the ISM methodology to analyze some of the important vendor selection criteria and have shown the inter-relationships of criteria and their levels. These criteria have also been categorized depending on their driver power and dependence. Sharma *et al* (1995) have implied ISM methodology to develop a hierarchy of actions required to achieve the future objective of waste management in India and so on. Therefore, based on the variety of industries have already applied the ISM to solve their problems; it is safe to say that the ISM can be applied in the Construction and Housing Industry in order to prioritise variables and solve problems.

4. ISM's Structuring Stages

The Mechanism of the ISM is explained by different scholars and researchers. These mechanisms defer in the way they were presented. Bolaños and Nenclares (2005) argue

that there are few steps should be followed to structuring the ISM. These steps are such as the variables are defined by the group at the beginning of the ISM planning session. The group also specifies a relational statement that defines the type of relationship desired. The relationships are structured logically and contextually and given to variable in different scenarios. Finally, the initial matrix of information is directly derived from these data – either from consensus after discussion or simply from individual answers.

Moreover, Mandal and Deshmukh (1994) propose technical analysis system which can be followed to achieve the stages of an ISM. This technical analysis system is illustrated in Figure 2 (see appendix).
Figure 2 shows that there are five main steps in the ISM technical analysis. These steps are as follows:
Step i: Self-structural Interaction Matrix (SSIM)
Step ii: Reachability Matrix
Step iii: Level Partition and Canonical Matrix
Step iv: Classification of Variables
Step v: Development of Digraph

Clearly, the procedure of setting the ISM can simply described as first; the process starts with the identification of variables, which are relevant to the problem or issue and then extends with a group problem-solving technique. Later on a contextually relevant subordinate relation is identified. After resolving the variable set and the contextual relation, a structural self-interaction matrix (SSIM) is prepared based on pair-wise comparison of variables. The SSIM is transformed in to a reachability matrix which includes variable transitivity. Finally, the partitioning of the variables and an extraction of the structural model, called ISM, is derived.

5. ISM Adoption in Construction/Housing Industry

There is no indication or limitation found in literature on why the ISM should not be adopted and used in the housing industry; therefore, an attempt for this purpose will be made to apply the ISM in the construction/housing industry in the following section. Mandal and Deshmukh (1994) believe that Interpretive Structural Modeling (ISM) is applied to transforming unclear, poorly articulated mental models of a system into visible well-defined, hierarchical models. It is a well-known methodology for identifying and summarizing relationships among specific elements, which defines an issue or a problem and provides a means by which order can be imposed on the complexity of such elements. Developed model is illustrated graphically as well as in words (logically and contextually). Moreover, The ISM methodology is interpretive and entirely based on the judgment of the group that decides whether and how the variables are related. In other words, the ISM structure relies on the basis of relationships and overall structure is interpreted from the complex set of variables.

The ISM process could be achieved by following steps (Mandal and Deshmukh, 1994):

Step One: Self-structural Interaction Matrix (SSIM)
Step Two: Reachability Matrix
Step Three: Level Partition and Canonical Matrix

Step Four: Classification of Variables
Step Five: Development of Digraph
Therefore, the above five steps will be followed to adopt and implement ISM in the housing industry. This process at the end will help decision makers in the housing industry identify, classify and prioritize the industry variables and therefore setting a sound strategies and policies.

Before starting the ISM process, it is important first to identify the variables that significantly affecting the housing industry. This will be achieved by using Entity Relation Model (ERM). The purpose of using the ERM is to identify the housing industry variables according to their importance, effectiveness and relations, and then reduce the total number of the selected variables to most important and reasonable. The final selected variables using ERM will be then prioritized by the ISM.

Beynon-Davies (2004) claims that an entity is a thing can be recognised as being capable of an independent existence and which can be uniquely identified. An entity is an abstraction from the complexities of some domain. When we speak of an entity we normally speak of some aspect of the real world which can be distinguished from other aspects of the real world.

Get-Ahead Website (2008) defines entity relationship diagramming is a technique that is widely used in the world of business and information technology to show how information is, or should be, stored and used within a business system.

The success of any organization relies on the efficient flow and processing of information. Thus, ERM will be used in the following to identify variables and their relations.

The housing industry consists of several variables which they vary in their role and importance. Some play a vital role whereas others have lesser effect. It is important at this stage to display the entity relations diagram for the housing industry variables. The entity relation model illustration appears in Figure 3 (see appendix).

According to Figure 3; and for the purpose of this research; the most important variables were defined as 13 variables. The identified variables (13) are enough to conduct the prioritising process and also to drive it into more confusion and complexity.

These (13) variables are listed as follows:

1. **Regulation & Legislations**
2. **Finance**
3. **Types of Projects**
4. **Availability of Local Know How**
5. **Foreign Know How**
6. **Availability of Building Materials**
7. **Availability Local Labour**
8. **Foreign Labour**
9. **Availability of Land**
10. **Development of Private Sector (SMEs)**
11. **Training**
12. **Types of Construction Method**
13. **Design**

Each variable was allocated a number as in the list above. The number will represent the variable in the following stages namely, matrices, tables, digraphs and prioritising and analysing processes.

Mandal and Deshmukh (1994) illustration of the ISM process and the five steps will be followed to perform the ISM in the housing industry:

Step One: Self-structural Interaction Matrix (SSIM)
Mandal and Deshmukh (1994) argue that the SSIM establishes a contextual relationship of "leads to" between criteria or variables in an industry. Four symbols are used for the type of the relation that exists between two sub-variables under consideration: V for the relation from *i* to *j* but not in both directions; A for the relation from *j* to *i* but not in both directions; X for both direction relations from *i* to *j* and *j* to *i*; and O if the relation between the variables does not appear valid.
These types of relationships are given English Characters such as V, A, X, and O. Each character indicates a type of relationship between two variables (in this case; *i&j*). The four types of contextual and logical relationships between variables *i&j* are illustrated as follows:

V: Variable *i* will help achieve Variable *j*

A: Variable *i* will be achieved by Variable *j*

X: Variables *i* and *j* will help achieve each other

O: Variables *i* and *j* are unrelated.

According to the above; types of contextual and logical relations; the SSIM Matrix for the 13 housing industry variables illustrated in Table 2 (see appendix).

Step Two: Reachability Matrix
Mandal and Deshmukh (1994) the SSIM has been converted into a binary matrix, called the Initial Reachability Matrix (IRM) by substituting X, A, V, and O by 1 and 0. For example, if criteria *i* leads to criteria *j* and criteria *j* leads to criteria *k* then criteria *i* must lead to criteria *k*. The process of bridging these gaps is known as transitivity check. The various possibilities are summarized as below:

Table 3: Contextual Relations (Mandal and Deshmukh, 1994)

Entry in SSIM (*i, j*)	**V**	**A**	**X**	**O**
Entry in Reachability Matrix (*i, j*)	**1**	**0**	**1**	**0**
Entry in Reachability Matrix (*j, i*)	**0**	**1**	**1**	**0**

The binary replacement orders for the bi-relationships (V, A, X, O) is explained as follows:

1. If (*i, j*) entry in the SSIM is V, then (*i, j*) entry in the reachability matrix becomes 1 and the (*j, i*) entry becomes 0.
2. If (*i, j*) entry in the SSIM is A, then (*i, j*) entry in the reachability matrix becomes 0 and (*j, i*) entry becomes 1.
3. If (*i, j*) entry in the SSIM is X, then both (*i, j*) and (j, i) entries in the reachability matrix become 1.
4. If (*i, j*) entry in the SSIM is O, then both (*i, j*) and (*j, i*) entries in the reachability matrix become 0.

Thus, the SSIM could be used to produce the Reachability Matrix for the housing industry variables. This can be implemented by replacing the letters (V, A, X and O) by their values they are given in the above table. The Reachability Matrix will become the matrix as in Table 4 (see appendix).

The final reachability matrix is obtained by checking for transitivities as explained in the Step above. The previous Matrix shows the 'Initial Reachability Matrix' and the Matrix below shows the 'Final Reachability Matrix'. In the Final Reachability Matrix, the driving power and dependence of each Variable are also stated. The driving power of a variable is the total number of variables, which may be helped achieve including itself. The dependence of a variable is the total number of variables that may help in achieving it.

Final Reachability and Transitivity Matrices of the housing industry can be illustrated in Table 5 (see appendix)

Step Three: Level Partition and Canonical Matrix
Mandal and Deshmukh (1994) state that different criteria have to be classified into four sectors, namely autonomous, dependent, linkage, and driver/independent, based on their driver power and dependence. Quadrant-wise characteristics of these sectors are given in the tables below (Iteration Table, Conical Matrix). Tables 6 (see appendix) in Mandal and Deshmukh (1994) can be used as an example to guide setting the Level Partition of Reachability Matrix (Iteration Table) and the Lower Triangulation Matrix (Conical Matrix) for the Construction/Housing Industry.
Interaction Table of the housing industry could be illustrated in Table 7 (see appendix).

Step Four: Classification of Variables/MICMAC Matrix
Mandal and Deshmukh (1994) believe that the objective of the MICMAC analysis is to analyze the driving power and the dependence of the variables.

Figure 4 (see appendix); MICMAC Matrix reveals the classification and status of variable. The figure also indicates each role of a variable and how it reacts as a deriving power and dependency. It is important to redisplay the variables below in order to identify them properly (not only by their numbers) and the role they play in setting strategies and policies of the housing industry.

As it is illustrated in Figure 4: MICMAC Matrix; The analysing process will be in four stages these four stages are listed as follows:

1. **Cluster I: Autonomous Variables**
2. **Cluster II: Dependant Variables**
3. **Cluster III: Linkage Variables**
4. **Cluster IV: Independent/Driving Variables**

It is easier to begin with analysing the variables in Cluster IV, Cluster III. Cluster II and Cluster I, respectively, because the process will give a chance to first explain what driving power and dependency mean.

1. **Cluster IV: Independent/Driving Variables**

In Cluster IV, variables: (1. Regulation and Legislations, 3. Type of Project, 13. Design) fall in this category are independent from the rest of variables. These variables (1, 3, 13) are the driving power of the housing industry, especially, variable (1): Regulation and Legislations which is the most driving force. Moreover, Regulation and legislations must be give first priority among variables. This means that decision makers in the housing industry must consider Regulation and Legislations as their first priority as a driving force towards achieving the target set by strategies and policies. Thus, a government must be prepared to introduce new Regulation and Legislations (along with the existing ones) in order to move forward in solving the housing industry crises. In other words, without the introduction of new Regulation and Legislations, all planning, strategies and policies are dead and a waste of time, cost and effort; or perhaps, it will be impossible to put the housing industry plans into a place and to move forward a single step in implementing strategies and policies without the required regulation and legislations.
Finally, solving the housing crises in a country requires fully committed and prepared government and decision makers to provide the right regulation and legislations in order to be able to implement strategies and policies and therefore, solve the housing crises.

2. Cluster III: Linkage Variables

None of the housing industry variables fell into this category.

3. Cluster II: Dependant Variables

Variables falls into this area; Cluster II, are known for other variable are dependent on them. These variables are No: 2, 7, 12 (Finance, Availability Local Labour, Types of Construction Method). Availability of Local Labour (7) falls right on the dividing line between Clusters I & II. The variable in this case might not be considered as strongly dependent. Whereas, variables (2&12): finance and Type of Construction method, are the stronger ones. It has to be mentioned that Variable (2): Finance, is the strongest dependent variable. This means that all other variables are totally dependent on Finance. Logically, without finance a person could not embark on anything. Decision-makers have to realise the importance of this fact. In other words, decision-makers have to find means for generating enough funds for the housing industry in order to implement the strategies and policies smoothly and without and delay. Therefore, the housing industry crises will be solved in time, efficiently and effectively.

4. Cluster I: Autonomous Variables

The final cluster is Cluster I. All variables fall into this cluster are weak and dependant on other variables; with significant driving power and dependency. The variables in this area are identified as 4, 5, 6, 8, 9, 10, 11. These variables are namely; Availability of Local Know How, Foreign Know How, Availability of Building Materials, Foreign Labour, Availability of Land, Development of Private Sector (SMEs), Training, and Design. Because these variables have no power and dependents on others, therefore, they are considered not important but should not be ignored when setting strategies and policies. Finally, according to the MICMAC Matrix, the housing industry variables could be classified under three prioritising groups depending on their score and location in the MICMAC Matrix.
The following section will clarify the prioritising process.

Step Five: Development of Digraph
Mandal and Deshmukh (1994) claim that from the Reachability Matrix the structural model can be structured by means of vertices or nodes and lines of edges known as a directed graph or digraph. Then, the element descriptions are written in the digraph and called ISM.
According the MICMAC Matrix in Figure 4, the Digraph in Figure 5 (see appendix) illustrates the priority groups and their urgency and degree.

The Digraph in the Figure 5, the (13) variables could be classified according to their score/priority. There are three groups identified. These groups are listed below:

1. **First/High Priority Group**

These variables are:

a. Regulation and Legislations,
b. Finance

These variables have top priority and considered very urgent among others. Decision makers must negotiate them first before they start planning and setting strategies and policies.

2. **Second/Medium Priority Group**

These variables are:

a. Types of Projects
b. Availability Local Labour
c. Types of Construction Method
d. Design

These variable are important but lesser important than First Priority Group and more Important the Third Priority Group

3. **Third/Low Priority Group**

These variables are:

a. Availability of Local Know How
b. Foreign Know How
c. Availability of Building Materials
d. Foreign Labour
e. Availability of Land
f. Development of Private Sector (SMEs)
g. Training

These are the lowest ranking group in terms of priority, ranking, driving power and dependency. This means that decision makers should consider them with lesser attention when planning strategies and policies for the housing industry.

To conclude; while planning strategies and policies for the housing industry, governments and decision makers must be prepared first to issue the required Regulations and Legislations in order to be able to move forward. These Regulation and Legislations facilitates all other variables in terms of availability, acquiring them, improving performance, and developing a sector within the housing industry. Moreover, it is important for governments and decision makers to provide a good estimated finance and secure the sources and figures. All other variables depend on finance and without or

perhaps, a lack of finance could undermined implementing the housing strategies and policies and become new problems on their own. Thus, Regulation and Legislations and Finance are the starting point and are the top priorities for planning strategies and policies.

The second ranking group of variables is Types of Projects, Availability Local Labour, Types of Construction Method and Design. These variables are also important and affect other variables; however, they are not as important as the first priority variables. They could be both as driving power and dependants upon.

Finally, the last group of variables are Availability of Local Know How, Foreign Know How, Availability of Building Materials, Foreign Labour, Availability of Land, Development of Private Sector (SMEs), and Training. These variables are weak on totally reliant on other variables in terms of driving power and dependency. They can only achieved by the availability of others. Government and decision makers should pay lesser attention to these variables because they are not the major players in strategy and policy planning and setting.

5. Conclusion

The findings of this research reveal that ISM is an effective tool that can be used to prioritise variables and assists decision makers setting successful and sound strategies and policies. The attempt of adopting the ISM in the housing industry, like other industries mentioned in literature, has also proven successful and the ISM could be significantly affective in construction and the housing industry. It is recommended that ISM could be adopted in all industries to help and assist in setting their strategies and policies. Moreover, it is also important to acknowledge the role of Entity Relations Model (ERM) in identifying and classifying important variable in the housing industry. Therefore, ISM and ERM are both important in assisting decision makers setting successful strategies and policies. The final outcome/result will be significant and would clarify all the ambiguity surrounding the planning process by ranking, prioritising, defining, determining, etc, all variables.

Finally, ISM and ERM use statistical, mathematical, software engineering methods in identifying, ranking and prioritising variables and their relations. This might scare inexperienced users off, however, ISM and ERM are not highly sophisticated mathematical computerised programmes. The mechanisms of ISM and ERM are based on logical and contextual interpretation of the relations among the industry's variables; therefore, users of ISM and ERM need to have some kind of experience in order to be more sufficient using the two models (ISM and ERM) and to get the right result which will be used in setting strategies and policies. Thus, ISM and ERM users need a little of practice and patience before they become familiar on how to use ISM and ERM.

6. Appendix: Figures and Tables

Figures: Figure 1:

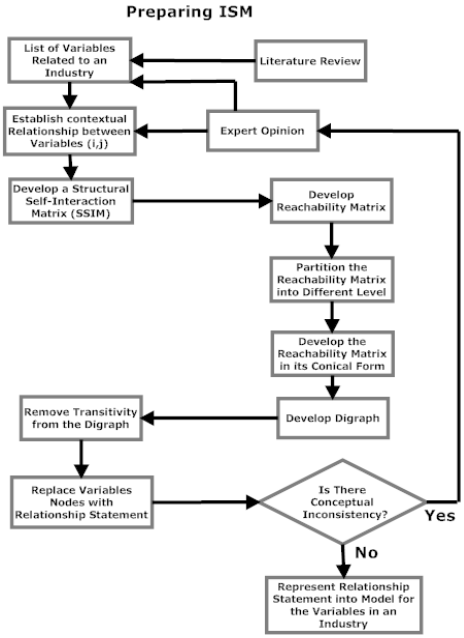
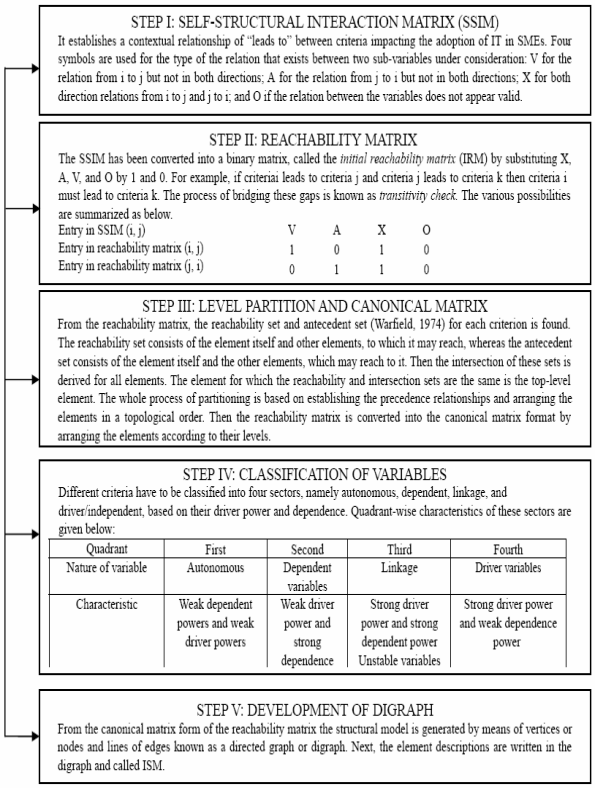


Figure 1: ISM Process Stages (Ravi V., and Shankar R, 2004)

Figure 2:



STEP I: SELF-STRUCTURAL INTERACTION MATRIX (SSIM)

It establishes a contextual relationship of "leads to" between criteria impacting the adoption of IT in SMEs. Four symbols are used for the type of the relation that exists between two sub-variables under consideration: V for the relation from i to j but not in both directions; A for the relation from j to i but not in both directions; X for both direction relations from i to j and j to i; and O if the relation between the variables does not appear valid.

STEP II: REACHABILITY MATRIX

The SSIM has been converted into a binary matrix, called the *initial reachability matrix* (IRM) by substituting X, A, V, and O by 1 and 0. For example, if criteriai leads to criteria j and criteria j leads to criteria k then criteria i must lead to criteria k. The process of bridging these gaps is known as *transitivity check*. The various possibilities are summarized as below.

Entry in SSIM (i, j)	V	A	X	O
Entry in reachability matrix (i, j)	1	0	1	0
Entry in reachability matrix (j, i)	0	1	1	0

STEP III: LEVEL PARTITION AND CANONICAL MATRIX

From the reachability matrix, the reachability set and antecedent set (Warfield, 1974) for each criterion is found. The reachability set consists of the element itself and other elements, to which it may reach, whereas the antecedent set consists of the element itself and the other elements, which may reach to it. Then the intersection of these sets is derived for all elements. The element for which the reachability and intersection sets are the same is the top-level element. The whole process of partitioning is based on establishing the precedence relationships and arranging the elements in a topological order. Then the reachability matrix is converted into the canonical matrix format by arranging the elements according to their levels.

STEP IV: CLASSIFICATION OF VARIABLES

Different criteria have to be classified into four sectors, namely autonomous, dependent, linkage, and driver/independent, based on their driver power and dependence. Quadrant-wise characteristics of these sectors are given below:

Quadrant	First	Second	Third	Fourth
Nature of variable	Autonomous	Dependent variables	Linkage	Driver variables
Characteristic	Weak dependent powers and weak driver powers	Weak driver power and strong dependence	Strong driver power and strong dependent power Unstable variables	Strong driver power and weak dependence power

STEP V: DEVELOPMENT OF DIGRAPH

From the canonical matrix form of the reachability matrix the structural model is generated by means of vertices or nodes and lines of edges known as a directed graph or digraph. Next, the element descriptions are written in the digraph and called ISM.

Figure 2: Technical Analysis (Mandal and Deshmukh, 1994)

Figure 3:

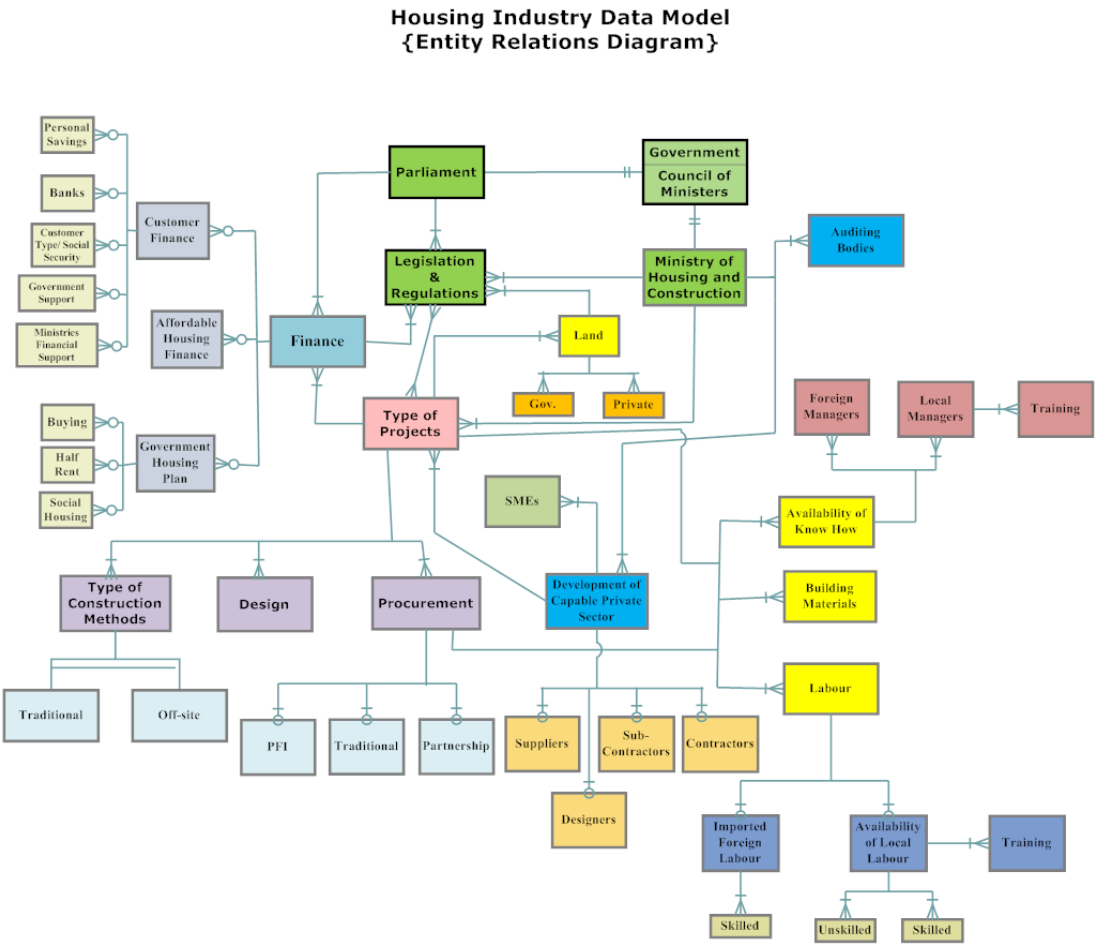


Figure 3: Entity Relation Model

Figure 4:

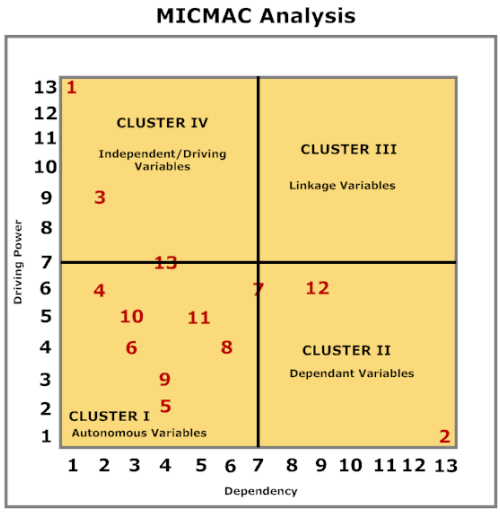


Figure 4: MICMAC Matrix

Figure 5:

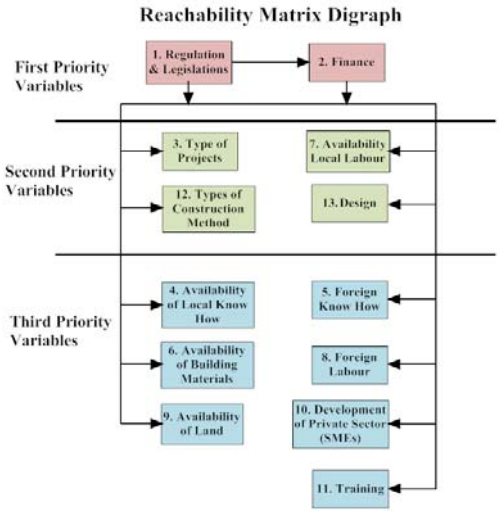


Figure 5: Reachability Matrix Digraph for the Housing Industry

Tables:

Table 1:

Table 1: ISM Application (Qureshi *et al*, 2007)

No:	Contributors	Area in which ISM Has Been Applied
1.	Saxena and Vrat (1990)	Energy Conservation in Indian Cement Industry
2.	Mandal and Deshmukh (1994)	Vendor Selection
3.	Sharma et al. (1995)	Waste Management in India
4.	Singh et al. (2003)	Knowledge Management in Manufacturing
5.	Ravi et al. (2005)	Productivity Improvement in Reverse Logistics
6.	Jharkaria and Shankar (2005)	IT-enabled Supply Chain
7.	Agrawal et al. (2006)	Modelling the Agility of Supply Chain
8.	Qureshi et al. (2007)	Modelling the Logistics Outsourcing Relationship Variables

Table 2:

Table 2: SSIM Matrix

Attribute	13. Design	12	11	10	9	8	7	6	5	4	3	2
0. Regulation & Legislations	V	V	V	V	V	V	V	V	V	V	V	V
1. Finance	A	A	A	A	A	A	A	A	A	A	A	
2. Types of Projects	V	V	O	O	V	V	V	V	V	O		
3. Availability of Local Know How	O	V	V	O	O	V	O	O	V			
4. Foreign Know How	O	O	O	O	O	O	O	O				
5. Availability of Building Materials	V	O	V	O	O	O	O					
6. Availability of Local Labour	O	X	X	X	O	X						
7. Foreign Labour	O	X	O	O	O							
8. Availability of Land	X	O	O	O								
9. Development of Private Sector (SMEs)	O	V	V									
10. Training	V	X										
11. Types of Construction Method	X											

Table 4:

Table 4: Reachability Matrix of Housing Industry Variables

Attribute	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0	1	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	0	1	1	1	1	1	0	0	1	1
4	0	1	0	1	1	0	0	1	0	0	1	1	0
5	0	1	0	0	1	0	0	0	0	0	0	0	0
6	0	1	0	0	0	1	0	0	0	0	1	0	1
7	0	1	0	0	0	0	1	1	0	1	1	1	0
8	0	1	0	0	0	0	1	1	0	0	0	1	0
9	0	1	0	0	0	0	0	0	1	0	0	0	1
10	0	1	0	0	0	0	1	0	0	1	1	1	0
11	0	1	0	0	0	0	1	0	0	0	1	1	1
12	0	1	0	0	0	0	1	1	0	0	1	1	1
13	0	1	0	0	0	0	0	0	1	0	0	1	1

Table 5:

Table 5: Final Reachability Matrix of Housing Industry Variables

Attribute	1	2	3	4	5	6	7	8	9	10	11	12	13	Driving Power
1	1	1	1	1	1	1	1	1	1	1	1	1	1	13
2	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3	0	1	1	0	1	1	1	1	1	0	0	1	1	9
4	0	1	0	1	1	0	0	1	0	0	1	1	0	6
5	0	1	0	0	1	0	0	0	0	0	0	0	0	2
6	0	1	0	0	0	1	0	0	0	0	1	0	1	4
7	0	1	0	0	0	0	1	1	0	1	1	1	0	6
8	0	1	0	0	0	0	1	1	0	0	0	1	0	4
9	0	1	0	0	0	0	0	0	1	0	0	0	1	3
10	0	1	0	0	0	0	1	0	0	1	1	1	0	5
11	0	1	0	0	0	0	1	0	0	0	1	1	1	5
12	0	1	0	0	0	0	1	1	0	0	1	1	1	6
13	0	1	0	0	0	0	0	0	1	0	0	1	1	4
Dependency	1	13	2	2	4	3	7	6	4	3	7	9	7	

Table 6:

Table 6: Quadrant-wise characteristics (Mandal and Deshmukh, 1994)

Quadrant	First	Second	Third	Fourth
Nature of Variables	Autonomous	Dependant Variables	Linkage	Driver Variables
Characteristics	Weak Dependant Power and Weak Driver Powers	Weak Driver Power and Strong Dependence	Strong Driver Power and Strong Dependence Power Unstable Variables	Strong Power and Weak Dependence Power

Table 7:

Table 7: Interaction Table for the Variables

Attribute/Variables	Reachability Set	Antecedent Set	Intersection Set
1. Regulation & Legislations	1,2,3,4,5,6,7,8,9,10,11,12,13	1	0
2. Finance	1,2,3,4,5,6,7,8,9,10,11,12,13	2	0
3. Types of Projects	2,3,5,6,7,8,9,12,13	1,3	0
4. Availability of	2,4,5,8,11,12	1,4	0

	Local Know How			
5.	**Foreign Know How**	**2,5**	**1, 3,4,5**	**0**
6.	**Availability of Building Materials**	**2,11,13**	**1,3,6**	**0**
7.	**Availability of Local Labour**	**2,8,10,11,12**	**1,3,7,8,1011,12**	**3**
8.	**Foreign Labour**	**2,12**	**1,3,4,7,8,12**	**1**
9.	**Availability of Land**	**2,,13**	**1,3,9,13**	**1**
10.	**Development of Private Sector (SMEs)**	**2,7,11,12**	**1,7,10**	**0**
11.	**Training**	**2,7,12,13**	**1,4,6,7,10,11,12**	**2**
12.	**Types of Construction Method**	**2,7,8,11,13**	**1,3,4,8,10,11,12,13**	**3**
13.	**Regulation & Legislations**	**2,9,12,13**	**1,3,6,9,11,12,13**	**2**

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Social enterprise in an urban FM setting: concepts and inter-relationships

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Abstract:
Many local authorities who carry the responsibility of facilities operation tend to be unable to run it efficiently in a sustainable manner, and this has been reflected by increasing costs. It is therefore vital to develop a sustainable design to maintain public facilities and services. Urban facilities management (FM) could be used as a mechanism to develop a sustainable design to manage public facilities operations. The UK government has highlighted the role of social enterprise as a model for maximising the public good through business solutions, as outlined in the Department of Trade & Industry report *'Social Enterprise: A strategy for success'*. Urban FM and social enterprise will act as the main concepts identified for this study. The underlying philosophy of urban FM was highlighted in the study conducted by the Public Management Foundation (PMF), where new models of delivering public services were sought. Resulting from that, by seeking a new organisational form that suits an urban FM setting, social enterprise could then be used as a stepping-stone in making the first move. Within this context, this study attempts to seek a new organisational form by exploring the variety of service delivery models with examples from other settings, emphasising the relationship between the urban FM and social enterprise concept to help the better running of public facilities operations in local government. In highlighting the above, this paper will further discuss the main concepts and their relationships by exploring the applications of these concepts in practice.

Keywords:
Public Facilities, Social Enterprise, Urban FM

1 Introduction

The literature review has revealed that one of the major problems faced by local authorities in running public facilities operations is the ever-increasing annual operational costs (Alexander and Brown, 2006, McShane, 2006, Ngowi and Mselle, 1998). In seeking solutions for this problem, some approaches have been applied such

as privatisation and outsourcing. These approaches seem to provide more efficiency than public services providers. However, many have argued about the way private companies should protect the public interest, while at the same time being profit-seeking organisations, as this could create a conflict of interest. Roberts (2004) raised these problems around two major trends involving service providers: the private and public sectors, and also agencies involved in the provision of community services. This has in turn given new impetus to the debate on urban FM. Within this context, this paper provides a contextual understanding of the urban FM concept and its underlying philosophy. With its strong relationship with the principles of social enterprise, this paper will further explore these two main concepts in theory and practice as an attempt in seeking a new organisational form to help better manage public facilities operations.

2 Literature Review

2.1 Facilities Management (FM) – New Direction

FM continuously grows and evolves in adapting to changes around organisational facilities. Productivity has led to new alignments in FM. The idea of these new FM alignments have been highlighted by Nutt (2004) in seeking a new direction for future FM. McRae (2004) pointed out the factors that will influence the requirements and expectations for the future. These factors are demography, technology, social attitudes, ethical pressures, human expectations and regulation. Of course there would be changes around the world, as rationally and normally the world's activities are moving towards not backward. Therefore, for future survival there is a greater need to have a strong organisational structure to adapt to changes and evolve around them. Many authors (Alexander, 2006, McRae, 2004, Nutt, 2000, Nutt, 2004, Roberts, 2004) including both practitioners and researchers have suggested theories towards the development, innovation, sustainability and sophistication of FM as guidance for future directions. The concept of urban FM has been cited as one of the major elements of future FM alignment, as indicated by Roberts (2004). He explains an exciting and expansive overview of the alignments of opportunities between FM and the management of public infrastructure, plus their associated services and urban community support.

2.2 Urban FM

Roberts (2004) identifies urban FM as, *"a logical extension of the need to reinvest in community facilities and systems, and provide a flexible 'platform', in which agencies and private sector can come together in a new and innovative setting for the benefit of the community"*. Many authors (Alexander, 2006, Kasim and Hudson, 2006, Nutt, 2004) have agreed with this initial idea of urban FM created by Roberts. However, there is no specific guideline on how this platform could work, where the services are provided by public agencies and private sector engagement. This could be a new way in delivering public services, instead of having either the public or private sector as the sole service provider. Furthermore, in having an appropriate platform for public and private sector engagement in a new way of delivering services, there are also concerns about how to manage community assets for urban sustainability (Alexander, 2008). Sustainability is a characteristic of a process that can be maintained at a certain level indefinitely. The implied preference would be for systems to be productive indefinitely, or to be 'sustainable'. It is because in this new age, natural resources have become

scarce, and humans need to preserve what is left for future generations. By considering these important factors in seeking new ways of delivering public services, the context for the study of urban FM could be suggested as having a new service delivery model to manage public facilities operations for urban sustainability.

The underlying concept of urban FM was provided in a study by the Public Management Foundation (PMF) (Steele *et al.*, 2003). This sought new models of delivering public services. The study has illustrated the UK government's review, which recommends reforms of the legal framework for organisational forms, and in particular the creation of a Community Interest Company form to meet the needs of social enterprise for delivering public services. As a result of that study, in order to seek a new organisational form that suit an urban FM setting, social enterprise could be used as a stepping stone in the process of finding this new model for managing public facilities operations. This is supported by Alexander (2006) who identifies social enterprise as the new economics. He says that, if the FM industry is to step up to this challenge, it will have to move away from traditional contracting models and towards models based on the public interest company. Therefore, it needs to be further explored. Kasim and Hudson (2006) have explored these new directions by outlining FM as a social enterprise model in a regeneration case study of neighbourhood facilities. Adding to this, Alexander (2008) carried out action research in managing community assets for urban sustainability through social enterprise approach. Accordingly, it can be said that urban FM provides solutions to a number of these problems through the creation of 'arms length' organisations with greater autonomy and access to capital. The following are amongst the advantages:

- The introduction of the techniques of business management, in particular efficiency improvement to public services;
- The introduction of market mechanisms and competition into public life;
- A greater service and customer orientation within public services.

2.3 Social Enterprise

Social enterprise is generally known as the social mission driven organisations, which trade in goods or services for a social purpose. (Spreckley, 2008) defines social enterprise as follows: "an enterprise that is owned by those who work in it and/or reside in a given locality, is governed by registered social as well as commercial aims and objectives and run co-operatively may be termed as social enterprise. Traditionally, 'capital hires labour' with the overriding emphasis on making a 'profit' over and above any benefit either to the business itself or the workforce. In contrast, there is social enterprise where 'labour hires capital' with the emphasis on personal, environmental and social benefit." According to the UK government's definition (DTI, 2002) the social enterprise sector includes organisations which "are businesses with primarily objectives whose surpluses are principally reinvested for that purpose in the business or in the community, rather than being driven by the need to maximise profit for shareholders and owners". Examples include co-operatives, building societies, development trusts and credit unions. Pearce (2003) argues that all are committed to community ownership and to the reinvestment of profit into the community. Regardless of that, social enterprise is not a charity or voluntary organisations; it is more than that, an enterprise with the equity finance to operate sufficiently.

Meanwhile, further study need to be undertaken in seeking the right type of organisational form that complies with social enterprise development through an urban FM setting. In this context, the following section discusses the aims associated with this research.

3 Research Problem and Aims

As derived from the literature review, the research problem based on which this paper is prepared, is to explore and identify a solution to solve problems faced by many local authorities in running public facilities operations. In this work, it is proposed that this could be done by taking urban FM as a mechanism to provide an appropriate platform for organisations to manage public facilities operations in order to develop a sustainable design for urban sustainability. Accordingly, understanding the principles of social enterprise and the underlying philosophy of urban FM as well as the support required creates the broader aim of this research. This will be achieved by developing an approach to have a new service delivery model that meets the needs of social enterprise in an urban FM setting. The target will be reached by exploring the variety of service delivery models for social enterprises that suit an urban FM setting. The main concepts extracted from the literature review are discussed in order to develop an initial conceptual framework. The conceptual framework helps to clarify the main ideas by giving the right routes while developing the study. This could be done by focusing on the subject area through the identification of the scope or boundary of the study. Subsequently, the constituent parts of a conceptual framework can be noted as the main concepts, the relationship between those concepts and the presence of a boundary within which the concepts and their interrelationships are applicable.

4 Urban FM in Relation to Social Enterprise

As derived from the discussion synthesised above, this study will explore the Urban FM concept by understanding the underlying philosophy of it. This is done by considering social enterprise as a stepping stone in the process of finding a new model for managing public facilities operations, as suggested in the PMF study. It is argued that in seeking a new organisational form which suits an urban FM setting that social enterprise potentially seems to offer this new kind of service delivery model. This direction could be potentially used as simply a logical extension of the need to reinvest in community facilities and systems, and provide a flexible ‘platform’ in which agencies and the private sector can come together in new and innovative settings for the benefit of the community (urban FM). For this reason the link between urban FM and social enterprise need to be reconciled in order to have a strong root to develop this new organisational form. This could be done by listing the contrasts between urban FM and social enterprise concept, as illustrated in Table 1 overleaf.

Table 1. Contrasts between the Urban FM and Social Enterprise concept

(Source: Pearce, 2003, Roberts, 2004, Steele *et al*., 2003, Thompson and Doherty, 2006)

Context	Urban FM	Social Enterprise (SE)
Term Definition	Provide a platform for agencies and the private sector to work together in an innovative setting to reinvest in community facilities and systems for the benefit of the community	The generic term for all trading enterprises which have a social purpose, a non-profit distributing and having a democratic, accountable and common-ownership structure
Characteristics/ Principles	Introduces business management techniques, in particular efficiency improvement to public services; Introduces market mechanisms and competition into public life; and Introduces a greater service and customer orientation within public services.	Having a social purpose or purposes; Achieving the social purposes by, at least in part, engaging in trade in the market place; No distribution for private profit; Holding assets and wealth in trust for community benefit; Democratic structure; and Being independent organisations accountable to a defined constituency and to the wider community.
Similarity	Local development and regeneration; Working for the state; Managing community assets and public facilities for community benefits; Market-driven business	Local development and regeneration; Working for the state; Providing services to the community for community benefits; Market-driven business

Although there are differences between these two main concepts, a series of similarities can be used as a strong base to develop a new organisational form. The differences could be used as advantages wherever necessary and appropriate to adapt into the new model. Accordingly, the link between urban FM and social enterprise could be illustrated in the figure below, in moving towards an approach to develop the new organisational form for managing public facilities.

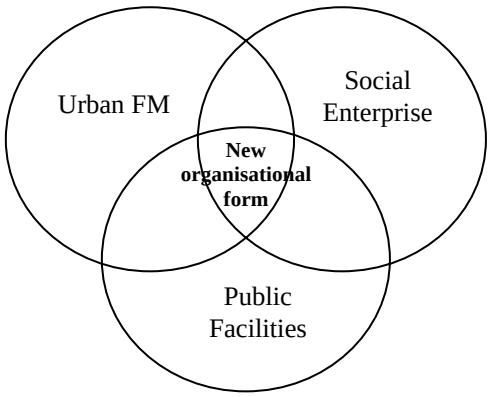

Figure 1. Relationship between Urban FM and Social Enterprise in creating New Organisational Form

Further, to clearly see the variety of business and service delivery in Urban FM and social enterprise setting, the next table (Table 2 & 3) will summarise some of the examples currently being practiced in the market.

In an urban FM setting, there are a variety of non-profit companies as well as profit making companies, despite all these companies being responsible for managing public assets or providing services to the public. They are bound to maintain public interests in running their businesses. These companies, which have shown a successful example in improving public service provision both in terms of quality and cost, have found ways of allowing the community to collaborate in deciding what services are provided and at what cost. Most importantly, they have allowed commercial expertise to be applied to the reorganisation of public services (Roberts, 2004). On the other hand, the variety of service delivery models in a social enterprise setting shows the range from profit-achieving businesses in a very competitive industry, but one with strong principles, through a profitable workers' co-operative to ones needing to find financial sustainability if they are to continue their social aspirations. In some of the enterprises the important contribution of a pivotal social entrepreneur is apparent. The need to create and add value for customers and clients are always apparent, as is the need to find effective routes to market. Thompson and Doherty (2006) concluded that whilst certain beliefs and principles are routinely evident, social enterprises most certainly could not be described as 'one-size-fits-all'.

This has given this exploratory study in looking into different types of service delivery models within an urban FM and social enterprise setting. Hence, to develop such a model for new organisational form, the similarities within these two themes need to be taken into consideration in the development process. Accordingly, the researcher will try to develop such a model based on the similarity criteria between the urban FM setting and the social enterprise context, as described above. These suggested criteria would be used as a foundation to explore the possibilities of for a developed model, where appropriate, in managing the public assets for Malaysian application, a country from which the researcher originates from. Nevertheless, the nature of the business or services provided, as well as the business' surroundings and local contextual factors, need to be taken into consideration for the suitability of the developed model.

Table 2. A Variety of Companies in an Urban FM setting

(Source: Roberts, 2004, Ross, 1999)

Country	Company Name	Type of Company	Description / Context
Florida, USA	Disney Corporation	Private company (Property Development)	Develop a new town 'Celebration' of 20,000 people. Set out to have better society through the design of a complete lifestyle. The management of community services used best practice in cleaning, waste disposal and the management of public areas. The town is managed by a town manager appointed by the holding companies. The town manager is responsible both to the residents and the holding companies, meeting targets both for user satisfaction and commercial returns. Celebration represents a living experiment in the application of Urban FM – a private company providing for the public good and under the control of customer-oriented professional managers. It sought to reconcile many of the problems identified in the Public Management Foundation report. Celebration captures the essential dilemma of New Public Management, and a dilemma that faces advocates of Urban FM.
UK	Norfolk County Services	Staff-led not-for-profit company	Provides a range of FM services to District Councils, County Councils, Health Trusts, Housing Associations and Schools. The company is wholly owned by its principal customers who are fully involved in the commercial and risk assessments of the business. Norfolk County Services is able to identify opportunities for joint working efficiencies between various community agencies it supports because of its independent status.
UK	Greenwich Leisure Limited	Staff-led 'Leisure Trust', Structured as an Industrial and Provident Society. GLL is also the UK's leading leisure 'trust' - a social enterprise, as a not for profit (reinvest surpluses back into leisure services for the community)	Manages more than sixty-five public leisure centres within the M25 area in partnership with the London boroughs. GLL's purpose is to collectively bring about social change and justice, by working with communities to: - Identify their needs, opportunities, rights and responsibilities - Plan, organise and take action - Evaluate the effectiveness and impact of the action Through the promotion, provision and delivery of quality sport and physical activity in partnerships, GLL strive to empower the local community to improve their health, well being and quality of life.
UK	Glas Cymru	A not-for-profit company limited by guarantee for the sole purpose of providing water services in Wales.	Under Glas Cymru's ownership, Welsh Water's assets and capital investment are financed by bonds and retained financial surpluses. All day-to-day activities are carried out by specialist contract partners employed by Welsh Water following a competitive procurement process. The Glas Cymru business model aims to reduce Welsh Water's asset financing cost, the water industry's single biggest cost, and improve service delivery by employing the best contract partners for each distinct activity in the business.

Table 3. A Variety of Companies in a Social Enterprise setting

(Source: Sharpen, 2006, Thompson and Doherty, 2006)

Country	Company Name	Type of Company	Description / Context
East Midlands, UK	Genesis	Company limited by guarantee with charitable trust status	It is an outstanding example of a 'project' that has serially provided more and more community-based services by seizing opportunity after opportunity - and establishing on-going financial sustainability.
West Yorkshire, UK	Suma	Workers' co-operative wholesaler of health and whole foods	It is a workers' co-operative in the competitive food distribution business. It is profitable but clearly delivers on its social agenda.
America	KaBoom!	Non-profit organisation	It shows how corporate donations can be harnessed to deliver social returns, but only with local involvement from the recipient communities. There is a belief that things should not be completely free. The central social entrepreneur is an archetypal entrepreneurial fixer or arranger
South Africa, Africa	Play Pumps	South African social enterprise	It is an African initiative, which uses a mixture of donations and loans to create sustainable activities for providing fresh water. It uses 'free labour' by harnessing the energy of young people at play.
Ghana	Trade Plus Aid	Social entrepreneur	Features an outstanding social entrepreneur who has committed to helping third world communities earn revenues from their production skills by providing them with a route to market. All surpluses are returned to the countries of origin or to others in greater need.
UK	Cafedirect	Fairtrade social enterprise	It provides market opportunities to 3rd world producers and charges above-average prices (which customers are willing to pay) to ensure community benefit
Kenya, Africa	Honey Care	Manufacturer and supplier	It is a model framework for helping small village communities produce honey which can be sold both in the country of origin and elsewhere at the expense of imported honey from the developed world.
Australia	Easybeinggreen	Energy and water business company	Energy-saving advocacy is at its core, but it offers relevant products and a paid-for installation service to fund the overall activity.
East Lancashire, UK	Trinity Partnership	Company limited by guarantee with charitable trust status	It illustrates how services can be provided by a mixture of trading and contracted activity
UK	Train 2000	Non-profit distributing company limited by guarantee	It shows how funds can be drawn down to provide services which generate economic activity and benefit 'for society' and in the process save on benefit payments
Merseyside, UK	Merseyside Dance Initiative	Company limited by guarantee with charitable trust status	Provides an example of a public funded social initiative that has delivered on its social agenda but has come to realise that it must increase the percentage of its income that comes from paid services and trading
London, UK	Bootstrap enterprise	Trading company as an enterprise	The core task is the recycling of computers donated from individuals and organisations. The equipment is collected, cleaned and upgraded and then sold on to charities, enterprises and individuals.
London, UK	Green-Works	Registered charity	Its primary aim is to prevent large volumes of office furniture from going to landfill. This is done through the collection of furniture from large London-based companies such as banks, recycling the unusable items and selling the rest to charities, churches, schools and individuals.

4.1 Criteria of the New Organisational Form

It was revealed from the literature that the theme of urban FM is an emerging concept in finding new and innovative ways to manage public facilities and community assets.

The main concepts taken for this study are urban FM and social enterprise. Within this context, this study will look into the suggested criteria discussed in the above section. The suggested criteria are identified based on the links between the similarities within and also between, the main concepts. It will act as the initial criteria, as developed from the literature review by looking at other settings and other countries in accordance with the underlying philosophy of urban FM and social enterprise principles. During the data collection phase of this study, (which is not covered in this paper), the pilot interviews will be conducted to get opinions from experts relating to the suggested criteria. These will later will be refined and developed before the case study is carried out. These criteria will be used as instruments to develop a new organisational form that particularly fits into the Malaysian setting, by taking into consideration the nature of the business or services provided in Malaysia.

Hence the issue considered to be the basis for this study is public facilities operation. Table 4 outlines the suggested list of criteria to be dealt with. It further explains the list within the context of the study.

Table 4. The list of the suggested criteria

The suggested criteria	Further explanation
Local development and regeneration	This involves the local 'infrastructure work' in providing services and facilities which support local economic activity
Working for the state	This is regarded as agencies through which services may be delivered, which were previously provided for by the public sector
Managing community assets and public facilities for community benefits	This is towards a social mission (seen to be more social than economic) by delivering related services for community benefit in response to local needs.
Market-driven business	This can range from non-profit (charitable status) companies to profit-making companies. By having social enterprise principles, it partly promote the social economy by making a profit

Taking into consideration the expert opinions about the suggested criteria, the researcher will develop a refinement model for new organisational form. This model will then be used as the basis to explore the applicability and suitability of a new service delivery model within the Malaysian context. During the latter phases of this study, the question of how to stimulate interests amongst companies, and how to invite current service providers to apply the characteristics of such a model, will be explored. In addition, so will the question of whether service providers will be willing to collaborate with local authorities to provide services in new and innovative settings for the benefit of the community.

It shouldn't be forgotten that all the private companies who are engaged in service delivery are profit-oriented. According to the examples given in Table 2 and Table 3,

it is visible that are many people, communities and associations that still care about public interests, community benefits and urban sustainability. It is assumed that by obtaining and understanding social enterprise principles, the newly created organisational form could be capable of operating without relying on government funding, and would be able to be sustainable and create profit. This profit would then be put back into the company in order to be self-sufficient. This is a fair assumption to make on the arrangements, as social enterprise is seen as a new form of company that is working towards a social mission. Having a variety of companies as social enterprises might enable interested bodies to choose the most suitable type of company relating to their mission and objectives. This will particularly not restrict them having to choose a charitable status company which is limited in profit-making but could expand choice by having a variety of profit-making companies available that comply with social enterprise principles in an urban FM setting. Accordingly, this study will target several Malaysian local governments to deploy a multiple case study approach in order to explore the applicability of such a model in Malaysian context.

Also, as mentioned in Table 2, the examples of various types of companies in urban FM settings can be listed from non-profit companies to the profit making companies, which allow commercial expertise to be applied to the reorganisation of public services. Additionally, as has been noted by Thompson and Doherty (2006), whilst certain beliefs and principles are routinely evident, social enterprises most certainly could not be described as 'one-size-fits-all'. Moreover, this argument is supported by Pearce (2003) by listing out the nine dimensions of social enterprise depending on their circumstances.

Table 5. List of Nine Dimensions of Social Enterprise

(Source: Pearce, 2003)

Nine dimensions of social enterprise	
1.	From very small to very large
2.	From voluntary enterprise to social or community business
3.	From dependence on grants and subsidies to financial independence
4.	From people orientation to profit maximisation
5.	From informal to formal economic activity
6.	From mono to multifunctional
7.	From voluntary organisation to social enterprise
8.	From radical to reformist
9.	From individual to collective initiative

Accordingly, from the theory and current practice, evident reflects that it is impossible to have a specific model to cater to all needs. The various types of business company objectives, the nature of business as well as the contextual factors involved need to be taken into account in order to make the new company complies with social enterprise principle in urban FM setting.

5 Research Methodology

This study attempts to seek a new organisational form by exploring the variety of service delivery model with examples from other settings, within the relationship between urban FM and social enterprise concept. As highlighted above, this study is at an early stage. A thorough literature review has been done to identify the potential criteria of new organisational form based on the similarities within and also between,

the main concepts. Then, pilot interviews will be undertaken in order to refine the characteristics of such a model based on the suggested criteria. Later, the case study approach will be deployed to explore the applicability of the model in Malaysian context.

Accordingly, this study involves an in-depth investigation within real life (Yin, 2003) by looking at different theories, current practices, having expert opinions in view of theory building as well as exploring the applicability of the model in Malaysian context. These values when combined with the definition above, makes the case study approach the most preferred for the study in question as this study adopts an explanatory, multiple, embedded case study. Therefore, taken into consideration of on field data to be collected in order to achieve the research objectives for this study it will deploy interviews, questionnaire survey and document review as a data collection techniques.

6 Conclusion and the Way Forward

In seeking a new organisational form as a new way of managing public facilities operations by using urban FM as a mechanism, it could be said that there is no one particular type of new organisational form that could be developed to fit all types of public facilities operations. However, there is a list of criteria that could be suggested as a guideline, as this study tries to seek a new organisational form that complies with social enterprise principles in an urban FM setting. Further, in the next stage of this study, the research problem investigated and the lack of social enterprise practices in the Malaysian economic structure provides a limitation in terms of the findings of this study. This study will explore the applicability of such a model in the Malaysian context by using it as an enabler in the urban FM setting.

This paper has defined the terminology of urban FM in its contextual nature of the problem being studied, also has identified some examples of good practices by looking at other setting and other countries parallel with the underlying philosophy of urban FM and social enterprise principles. Consequent upon that, being a starting point from this study, further research could investigated how this new approach of new organisational form could make a major difference from the traditional service delivery providers: the private and public sectors, as well as agencies.

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A web-based toolkit for process management of Further and Higher Education co-location programmes

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Abstract:
Collaboration in Further and Higher Education has been encouraged by the UK and Scottish Governments to improve efficiency and value for money. Physical co-location of institutions offers opportunity for cost saving through shared service provision, detailed academic collaboration as well as encouraging articulation and improving access to education for the local community. Co-location requires careful programme and process management to be successful and practical guidance is required to both those institutions managing the co-location and to funding bodies approving the financial investment. This project has observed the co-location development of the Scottish Borders Campus between Heriot-Watt University and Borders College and compared the development activities with best-practice programme management guidelines. The proposed best-practice co-location process has been illustrated using a web-based toolkit and will be available to future co-location programmes as part of the Scottish Funding Council's guidance on Estate Management.

Keywords: academic collaboration, co-location, higher education, further education, shared services

1 Introduction

To improve the efficiency of delivering Further and Higher Education, collaboration between institutions has become increasingly common across the UK. Physical co-location of institutions is a major collaborative venture that requires careful management of all aspects of the business and presents unique challenges to the institutions involved.

A three-year research project has been undertaken by the School of the Built Environment at Heriot-Watt University and funded by the Scottish Funding Council (SFC) to follow the development of the co-location at the Scottish Borders Campus in Galashiels in the Borders Region of Scotland. The main aim of the research project is to develop and validate a best-practice process map for future Further Education / Higher Education co-location programmes to give guidance to both the institutions involved

and to the SFC in managing their Investment Approval gateway lifecycle. Much work has already been done in documenting best-practice for construction projects (University of Salford, 2008; RIBA, 2007). However, for the wider aspects of co-location and the management of organisational change that is implied, little guidance currently exists.

The best-practice process is being developed based on understanding current best-practice programme management methods, combined with observation of the co-location programme and lessons learned from the programme. The process map is being aligned with the SFC's Investment Approval gateway lifecycle. The process map is being validated by comparison with both the Scottish Borders Campus and other co-location programmes. A case study report on the Scottish Borders Campus is being written to supplement the process map and it is hoped to add additional case studies of other co-location developments. The best practice process map is being delivered by both traditional paper-based documentation as well as a web-based toolkit to support co-location programme management in both managing a co-location programme and also in meeting the expectations of the SFC at each investment gateway.

An additional important aspect of the research project focuses on performance measurement of a co-location programme. This paper does not report on the performance measurement research.

2 Background

2.1 Government initiatives

As part of a drive to reduce the size of the public sector budget, in 2003 the UK government appointed Sir Peter Gershon to perform a comprehensive review of efficiency across all public services within central, regional and local government (National Audit Office, 2004). Following on from the Gershon Review, an efficiency team was set up within the Office of Government Commerce to ensure that the identified savings would be achieved by the target date and also to instil an on-going culture of efficiency across the public sector (Office of Government Commerce, 2008). This efficiency drive has been supported by initiatives from the Scottish Government (Scottish Government, 2004). Sharing services and streamlining bureaucracy have been identified as priority areas. Service areas such as procurement, payroll, HR, IT, finance, legal and communications services were identified as having a high potential for sharing across government departments. While recognising that Further Education (FE) and Higher Education (HE) comprise a number of independent organisations with a multiple sources of income, they were included as part of the public sector initiative due to the large amount of public funding received (Scottish Government, 2006).

In addition, other Scottish education initiatives sought to improve access and participation, and articulation and routeways (Scottish Government, 2003). The goals are to improve the proportions within Higher Education of students from economically disadvantaged groups, to improve retention rates across the sector and to provide a range of options and paths to achievement, for example, to encourage easier progression from FE to HE courses. To this end the previously separate Higher and Further Education Scottish Funding Councils were merged to form a single Scottish Funding

Council (SFC) in 2005 to distribute funding across both FE and HE sectors and with responsibility to progress these goals.

2.2 Collaboration in the Further and Higher Education sector

Across the UK, there is already a wide range of collaborative projects across the FE and HE sector aimed at making cost savings as well as improving educational opportunity. For example, the Joint Information Systems Committee (JISC) provides world-class leadership in the innovative use of ICT to support education and research. The Universities and Colleges Admission Service (UCAS) is responsible for managing applications to higher education courses in the UK. The Quality Assurance Agency (QAA) sets standards of higher education qualifications and encourages continuous improvement in the management of the quality of higher education.

The sharing of services between institutions provides an opportunity to improve the efficiency and quality of service delivery. The most common areas that have been successful are in information technology, procurement, library provision and estate services. The Scottish Digital Libraries Consortium and APUC (Advanced Procurement for Universities and Colleges) in Scotland are examples. Other areas are staff training, finance, marketing, student accommodation and recruitment. However, in a competitive environment, the need to retain individuality is a limiting factor.

Academic collaboration in both research and teaching takes place between many universities to provide critical mass and advance achievement, for example, the combined St. Andrews/Manchester medical programme. The Open University (OU) provides course materials to other institutions to support their existing courses.

The University of the Highlands and Islands in Scotland is a formal partnership of colleges, learning and research centres based on separate sites, working together to provide university-level education. It aims to improve opportunities to achieve HE qualifications in a highly dispersed rural area by providing a critical mass of students using technology to deliver course material while also supporting the economies and communities of the region.

Co-location is when two or more institutions share a common campus and collaborate on sharing space, services and/or educational provision. For example, the Stoke-on-Trent university quarter is being constructed as a combined campus shared between Staffordshire University, Stoke-on-Trent College of Further Education, The City of Stoke-on-Trent Sixth Form College and other partners. Universities at Medway has brought together the University of Greenwich, the University of Kent, Canterbury Christ Church University and Mid-Kent College at a shared campus at Chatham Maritime. The Crichton University campus in Dumfries was Scotland's first multi-institutional campus, hosting the University of Glasgow, the University of the West of Scotland and Dumfries and Galloway College.

The Scottish Borders Campus has been created as a co-location venture between Borders College, the sole Further Education College in the Borders region, and the School of Textiles and Design and the School of Management and Languages of Heriot-Watt University. In order to address financial issues in both institutions and also to

ensure the continued presence of a vibrant educational provision in the Scottish Borders, the two institutions entered into a co-location partnership to create a new joint campus comprising newly constructed buildings and refurbished established buildings. The complete campus is due for occupation in 2009. Efficiencies have been planned by improving space utilisation, agreeing to share service provision (ICT, Facility Management, Library, and Catering) and by introducing a new course structure within the School of Management and Languages to allow flexible entry and exit points thus broadening the appeal of the courses being provided.

There are many examples of complete merger of educational institutions, for example, The University of Paisley and Bell College in Scotland have merged to form the University of the West of Scotland, resulting in improved efficiencies and better access to Higher Education opportunities within the west of Scotland.

2.3 Collaborative Projects

The business world has many examples of collaborative programmes gone wrong. Often at the whim of higher management and without buy-in from those involved, external or internal collaborations are usually initiated with the goal of improving efficiency or saving money.

Cultural differences are bound to exist between even similar organisations. These differences may include the level of expertise within each organisation, the motivation and aspirations of staff, language and terminology, the sense of organisational self-esteem, processes, ways of working and many other factors. As a result, collaborative programmes need more formal and more rigorous programme and process management to be successful. Adopting an agreed process from the start helps to clarify assumptions about how the programme should proceed and what expectations each partner should have of each other.

Each partner needs to feel in control and in a position of influence within the relationship with a significant something to gain from the relationship and not feeling threatened by it. For these reasons, collaborations work best if initiated from within each organisation and not imposed by a third party or higher management. The feeling of win-win must naturally flow down to every level of the organisation otherwise no amount of ‘stakeholder management’ will be successful.

2.4 Benefits of co-location

The main benefit of co-location has been the opportunity to improve the efficiency of managing the estate by sharing space and services within a common campus, even though the current VAT law presents an obstacle.

New opportunities for academic collaboration arise when the collaborating parties are physically located on the same site. Developing common course material between the different institutions and allowing flexible deployment of staff can achieve improvements in the efficiency of learning delivery. Common courses between Further and Higher Education also encourages articulation through to degree level, allowing access to a wider section of the community.

Creating a larger student community also creates opportunities to make minority interest courses viable, providing critical mass of student numbers and an acceptable business model. A larger student community also may improve the student experience by enhancing the campus atmosphere and making a wider range of student services, facilities and activities more easily available. It may also allow investment in teaching methods, technology and specialist equipment that not only improves the student experience but also results in a higher student retention and success rate.

In many rural educational institutions, co-location may help to retain educational provision in the local community when there may be a tendency for students to leave the area in pursuit of the opportunities they aspire to. The presence of a thriving educational institution has many economic benefits, not only as a result of the spending power of the student community but also in encouraging commercial ventures between the institution and local businesses.

The cost of initiating a co-location programme and the added complexity of the long-term management of the campus need to be fully considered. Other dis-benefits need to be fully assessed. Although a wider student community has potential positive benefits there is also the danger of cultural incompatibilities between sections of the new enlarged student community. Staff issues may also arise, especially if staff numbers are to be reduced to achieve the savings that are expected. Working conditions and expectations (written or unwritten), independence and freedom of approach and other cultural issues may create resistance from staff and need to be carefully managed from the start. Many Trades Unions oppose the idea of shared services because of the impact on their members' jobs and conditions. Open communications and provision of information are vital to create the right atmosphere.

3 Research methodology

The research methodology has been to understand best practice in programme management methodology, observe the progress of the Scottish Borders Campus co-location programme and determine how it could map into a best-practice process map.

The process map will be validated against other similar collaborations. A simple means of process representation has been determined and a method of web-based process representation that allows easy maintenance of the process details during development as well as in the longer term. Both web-based and paper-based process representation is required with minimum duplication of data and effort.

4 Development of the process map

4.1 Principles of Programme Management

Many lifecycles and methodologies exist for both project and programme management. Within the UK, the Office of Government Commerce (OGC) have developed what could be considered 'best in class' methodologies for project management – PRINCE2© – and programme management – Managing Successful Programmes©. The

focus of project management is to deliver a set of products or services to a customer group. The goal of Programme Management, however, is to

manage the delivery of transformational change to an organisation and to focus on the delivery of outcomes and the benefits arising from these outcomes. To do this, a Portfolio of Projects may be required to deliver outputs (or enablers) that are used to achieve the required outcomes and realise the programme benefits.

OGC guidelines and the terminology used have informed the approach taken in the development of the best-practice co-location programme lifecycle.

4.2 Co-location Programme Lifecycle

The biggest contribution to the cost of a co-location programme is almost certainly going be the construction and/or refurbishment projects at the heart of the programme. For this reason, the co-location programme lifecycle is organised around the lifecycle of the construction project(s) (see Fig 1). The status of the construction will provide the major factors to be considered at each gateway investment decision stage. The SFC defines the following phases to the process lifecycle:

- Strategic assessment
- Business Justification (outline business case)
- Procurement Strategy (full business case)
- Pre-tender
- Pre-construction
- Post Occupancy Evaluation

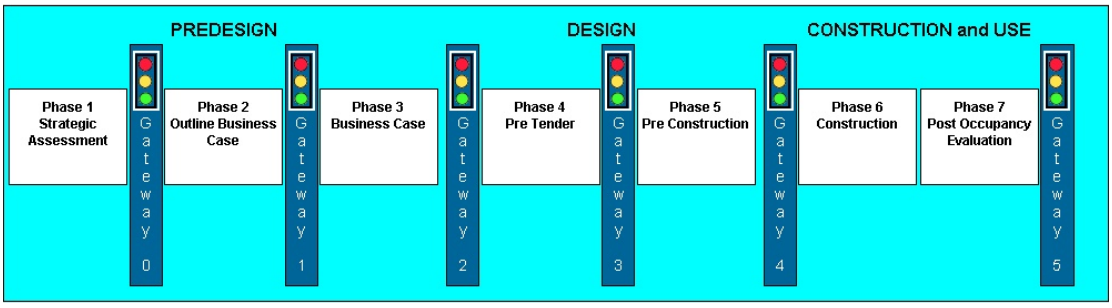

Fig 1 Overview of programme lifecycle

It is assumed that the construction process is using an industry standard lifecycle such as the RIBA Plan of Work (RIBA 2007), for example, and that the management of the construction project(s) is being performed by experienced construction professionals. It is also assumed that while the requirements for the construction design need to be agreed by the co-location partners, the construction process is not affected by the fact that this is part of a co-location programme. The Scottish Funding Council has already defined the expectations of an educational construction project at each of their investment approval gateways. For these reasons, the focus of the process map is not on

the construction process but rather on the other unique aspects of a co-location programme.

In deciding on the phases of the other projects within the programme with respect to the SFC gateway lifecycle, which is determined by the construction projects, it is necessary to consider what impact each project will have on the business case. If the impact or risk is high then it is assumed that detailed plans should be in place for the Full Business Case. If low, then it is assumed that detailed work, and the associated costs, can wait until after the Business Case has been approved.

The process map assumes that each project should have a detailed brief in place by the submission of the Full Business Case, but that detailed plans for each project are not needed until after the Full Business Case. Individual programmes may need to review this assumption.

4.3 Benefits mapping

One valuable programme management tool to summarise the goals of a programme is a Benefits Map. A Benefits Map illustrates the outcomes and benefits arising from the programme, how these benefits align to strategic objectives and what project outputs and business changes are required to achieve the outcomes and associated benefits. For each outcome, a measurable benefit should be defined. The set of measurable benefits then establishes the criteria for programme success.

Although a benefits map needs to be tailored to an individual programme, there are common themes that may be identified in all educational co-location programmes.

For example, financial health, high quality education, contribution to social sustainability, improved access to education etc.

As a result, is possible to produce an example co-location benefits map that may be applicable to many co-location programmes as a possible starting point for fine-tuning see Fig 2.

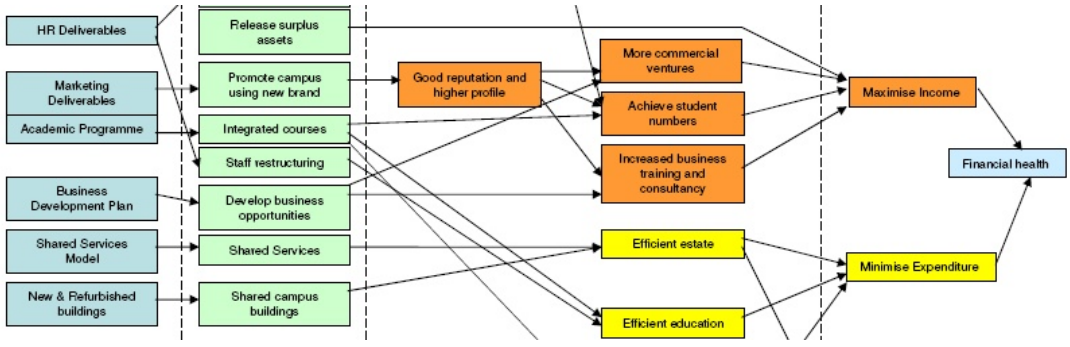

Fig 2. A section of an example co-location benefits map

Following the benefits mapping exercise on a generic educational co-location programme, a proposed set projects required to support the programme can be

identified. These are the Construction Project(s), Facilities Management, Student experience, Stakeholder Management, Human Resources, Marketing, Academic collaboration, Shared Services, Business Development, Legal agreements, Community Engagement.

4.4 Activity Zones

The term 'Activity Zone' has been used to organise the presentation of other process maps, for example the Process Protocol developed by the University of Salford as a guide to process management in the construction industry (University of Salford, 2008) They define an Activity Zone as "a structured set of sub-processes involving tasks which guide and support work towards a common objective". The co-location process map uses the concept of Activity Zones to illustrate the process map. The following Activity Zones are used: Strategic Management, Programme Management, Change Management (covers the projects responsible for stakeholder engagement and communication, HR, Marketing and the student experience), Academic collaboration, Shared Services, Design and Construction and Facilities Management.

4.5 Process mapping methodology

Various methodologies exist for representing and modelling business processes. IDEF3 (Knowledge Based Systems Inc. 2006) is one such mechanism for collecting and documenting processes. SIPOC (an acronym for Suppliers - Inputs - Process - Outputs – Customers) is a method of representing high-level process maps in 6Sigma process analysis. 6 Sigma is a quality management strategy used widely within manufacturing industry.

The purpose of the co-location process map is not to provide precise process representation and analysis but rather to provide a means of illustrating at a high level the process steps and the sub-processes involved in progressing the programme lifecycle. It is also a goal of the web-based toolkit to provide an automated web tool to draw the process diagrams from a set of process definitions. For this reason, no attempt has been made to illustrate branching, junctions, recursion or flow on the process map and simple rectangular boxes have been used (see Fig 3). Provision has been made for up to three process levels where necessary.

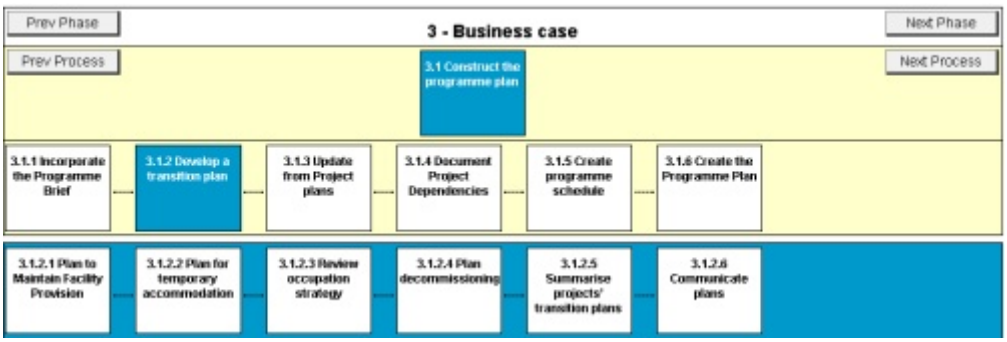

Fig 3. Three-level process representation

The SIPOC idea has been used to provide information about each process with definitions of Suppliers, Inputs, Outputs and Customers along with process descriptions and other information. In addition to the process map, a tree view is supplied to give an alternative view of the process hierarchy (see Fig 4).

Fig 4. A section of the tree view of the co-location process

4.6 Generation of Gateway checklists

At the highest level, the process map can be used to generate checklists of inputs to each SFC Investment Approval gateway. While the gateway process may only require the one major input, for example, the Business Case or a Gateway Report, the extended list of inputs provides the SFC to opportunity to ask whether all supporting inputs have been completed and to request additional inputs if necessary. It also provides Programme Managers with a means of checking that the programme is on schedule and that the relevant processes have been completed. The checklists for each gateway are automatically computed from the list of process outputs where the gateway has been defined as a customer (see Fig 5).

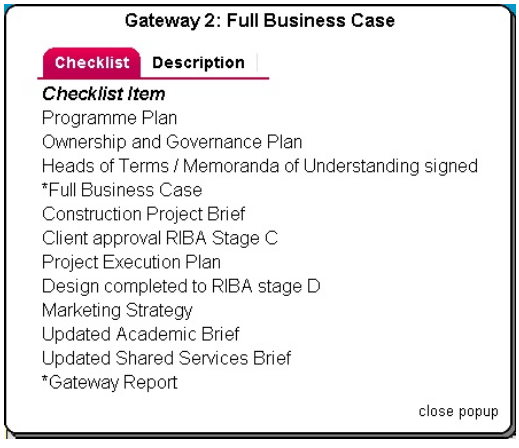

Fig 5. Example of a gateway checklist

4.7 Implementation of paper-based map and web-based toolkit

Process descriptions are important documentation in any organisation. They need to be easily reviewed, approved, circulated, shared, printed, revision controlled and change managed. For these reasons, it was considered best not to embed process data within a web site or to use a proprietary or poorly supported tool. From the start it was also

identified that users of the process map may prefer a word processor or paper-based way of using the map. The existing SFC process descriptions are available within a paper-based word processor.

To be able to supply both paper-based and web-based process representation without duplicating information and effort, process definitions have been developed using an MS Word document. By inserting xml tags into the MS Word document, process information can be saved as an xml file which can then be uploaded to the web server (see Fig 6). Some MS Word macros have also been written to support the generation of the xml data. In this way, the information in the MS Word document is kept in step with the web-based version.

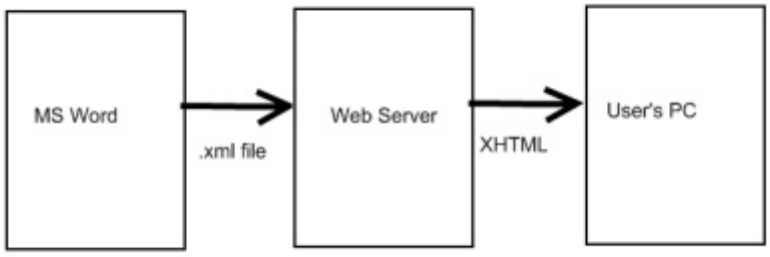

Fig 6. xml files are generated from MS Word and uploaded to the web server

Software running on the web server reads the xml file containing the process definitions and automatically draws the process map and the process tree. The information associated with each process, namely the Suppliers, Inputs, Outputs, Customers, process descriptions etc can be viewed on pop-up panels on user selection.

In summary, the features of web-based toolkit are:

- Ability to read process definitions from an xml file generated from MS Word.
- Ability to automatically draw a process map and a process tree.
- Provision of detailed information on each process on user selection.
- Automatic generation of gateway checklists from process definitions.
- Up to 3-level process representation.
- High-level entry plus ability to drill down into details.
- Access to other process information, for example case studies, benefits mapping, pdf version of process documentation.

5 Conclusion

Government initiatives within the UK and Scotland to improve efficiency within the public sector have led to increased collaboration within Further and Higher Education. The principal areas that promise cost savings are collaboration on educational provision and collaboration on sharing service provision. This research project has been following the development of the Scottish Borders Campus co-location programme between Borders College and Heriot-Watt University and has developed a best-practice process map suitable for future co-location programmes. The best-practice process map has

been developed through a combination of knowledge of current best-practice programme management methodology and observation of the progress of the programme at the Scottish Borders Campus.

The best-practice process map has been presented using a web-based toolkit and also by a traditional paper-based approach. This is achieved by defining process definitions in an xml data file that can be uploaded to a web server. Web server software has been developed to read the xml data files and automatically draw the process diagrams in both a process map and a process tree format. Checklists to allow readiness for SFC investment decision gateways are automatically generated based on the process definitions.

Further work will be done to integrate the web-based toolkit with the SFC's web site and further validation of the process map with other co-location projects within the UK will be performed.

6 Acknowledgements

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Research on partnering relationship between contracting parties in Chinese construction industry

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Abstract:
The main objective in the construction industry is to deliver a high quality project within schedule, on budget, safe manner and with the least number of conflicts, disputes, claims and litigations. However, due to the risky, uncertain and competitive nature of construction industry, conflicting goals among all participant parties involved in a project are bound to cause them only think for their own interests and benefits, in many instances this may leads to disputes, and then may be the expensive claims and costly litigations, so to a great extent the projects can not be completed within time and on budget, these contracting parties fall into a win-lose situation. In recent years, many projects had adopted the new management method called "partnering" to make a good relationship with all parties so as to cooperate well to make project successful in the developed countries. The partnering approach indicates the fact that all contracting parties should act on a cooperative, mutual-trust, friendly manner. Therefore, one of the main principles of partnering is to encourage all parties to change their relationships from traditionally adversarial to cooperative. This change in relationships requires changes simultaneously in attitudes to achieve mutual trust, respect, and open communication among all parties involved in the project. This research will focus on two aspects in Chinese construction industry, one is that actually which important factors can lead partnering implementation to success, and the other one is whether partnering relationship has positive impact on project success.

Keywords:
China, Construction management, Partnering relationship, Project success.

1 Introduction

In the past about two decades, going with the high-speed development of society and economy, construction industry on the China mainland is also growing very fast, especially there are more and more large and complex construction projects. With 1989 as an exception, the total investment in fixed assets on the China mainland has been increasing with an average growth rate of nearly 20% since 1980 (National Bureau of Statistics of China, 2002), it is evident that construction industry in China

has became more and more important for economic fast growth, meanwhile, construction project management is important and crucial for construction industry's fast growth and success.

Construction project management has many facets, relationship management is one of these facets. However, on the China mainland, very little attention had been addressed on these important relationships and relationship management, it results in poor communication and distrust between these parties and further influences cost, time and quality of the construction projects, because each party only think for their own interests and not for total success of the construction projects, so it leads to costly litigation and win-lose situation. There are very little investigations which have been made to find out potential factors influencing the implementation of partnering relationship (strategic partnering) in Chinese construction circumstances, and the relationship between partnering relationship (strategic partnering) and project success.

Some main debates exist in Chinese construction industry are listed in the below:

1. Cooperation spirit between these contracting parties is non-existent.
2. Top management of these parties does not really realize the significance and contribution of cooperation, so their support is very few.
3. These contracting parties even know very little about the true meaning of partnering (strategic partnering).

2 Literature Review

Concept of partnering has developed for many years in different countries and industries, and many researchers have conducted many theoretical studies in both the definition, the model, the benefits, those critical success factors (CSFs) of partnering relationship, and empirical studies have also focused on the development of partnering in some developed countries, such as America, UK and Australia.

Partnering and partnership in the field of engineering especially in the construction sector have been becoming a more popular and significant topic, so many researchers have published many relevant publications to present their opinions in the concept of partnering and partnership during the last twenty years, a good number of researchers had made good efforts to try to give a precise definition for this concept, there are still not an universally accepted definition for it, although there are not many differences between them (e.g., Crowley and Karim, 1995; Crane, Felder, Thompson, Thompson, and Sanders, 1997; Rankin, 1998; Cheng, Li, and Love, 2000; Bresnen and Marshall, 2000a, b; Bayramoglu, 2001; Liu and Fellows, 2001; Naoum, 2003; Beach, Webster, and Campbell, 2005; Anvuur and Kumaraswamy, 2007). For example, Bennett and Jayes (1997) published an important research publication and asserted that after many years' development partnering has experienced three "generations", and each one is different from the others in both concept and design, hence there are also differences in the definition (Bennett and Jayes, 1997). Naoum (2003) suggested a relatively newer concept of partnering, it is that "partnering is a concept which provides a framework for the establishment of mutual objectives among the building teams with an attempt to reach an agreed dispute resolution procedure as well as encouraging the principle of continuous improvement" (Naoum, 2003, pp.71).

There are also many empirical studies on partnering (e.g., Larson, 1995; Chua, Kog, and Loh, 1999; Crane, Felder, Thompson, Thompson, and Sanders, 1999; Black, Akintoye, and Fitzgerald, 2000; Cheng and Li, 2001, 2002; Walker, Hampson, and Peters, 2002; Cheung, Ng, Wong, and Suen, 2003; Chan, Chan, and Ho, 2003a, b; Bayliss, Cheung, Suen, and Wong, 2004; Kadefors, 2004; Chan et.al., 2004; Tang, Duffield, and Young, 2006; Lu and Yan, 2007a,b). Early in 1987, the United States Construction Industry Institute firstly conducted a practice to see whether the pattern of partnering can be used to benefit their business successfully and to emphasize the great opportunities in the construction industry (CII, 1991). Additionally, several years later a study conducted in the United Kingdom obtained a result that more and more different organisations and industries have paid much more attention to the development of the partnering practices and had enthusiasm to have a try to make partnering relationships or strategic alliance with their business partners by different methods (Burnes and New, 1996), and meanwhile some researchers have paid attention to the benefits of the pattern of partnering, perhaps including waste minimisation, operational efficiency and productivity improvements, cost reduction and cooperation performance improvements. Naoum (2003) also indicated the benefits of partnering, such as "improves productivity, lowers costs and provides the product of construction to satisfactory standards and time", and pointed out that partnering is still in the developing process after several years' development (Naoum, 2003, pp.71). Another study was also made in the United Kingdom, to estimate the development of their construction industry after many companies in this sector adopted partnering as a tool, to assess the partnering relationships between the main contractors (MC) and the subcontractors (SC), but the most important result is that it generated a conceptual framework by using some significant and reliable variables, even though it can only be seen as a good experiment to formulate some useful outcomes from the empirical data and it can not assert some actual causalities, it is also seen as a breakthrough that critically pointed out that "clients and not suppliers were found to be major barriers to the industry's adoption of partnering" (Beach, Webster, and Campbell, 2005, pp.611).

But there are also some debates and arguments on whether partnering can really bring the supposed benefits and project success. Bresnen and Marshall had several papers to present their opinion about partnering relationship. Bresnen and Marshall (2000a) pointed out that partnering and other related forms of cooperation had been considered as an important way to deal with the fragmentation and lack of cooperation in the construction industry, but the researches and reports just remained at a prescriptive level, and empirical evidence about the implementation of partnering in practice were still very few and anecdotal. So it is difficult to measure actually how much observed performance improvements are related to partnering directly (Barlow, Cohen, Jashapara and Simpson, 1997). Bresnen and Marshall (2000a) also indicated that most of the literature on partnering had focused mainly on experiences in some developed countries, such as UK, USA and Australia, and suggested the intention to investigate partnering in other national contexts should be cautious. Partnering requires the organizational culture transformation to suit for the mutual objectives, but the problem is that the organizational culture is well established and it is difficult to make changes within organizations, let alone between them, organizational culture is not simply a variable that can be manipulated in the way that structures or other systems can be changed (Bresnen and Marshall, 2000a, b). Bresnen and Marshall (2000c) debated that whether or not single project partnering is feasible. Through

these papers, it can be found there are some different opinions on the real benefits and limitations of partnering, so this research on partnering should consider these important views, and have critical thoughts on all of the literatures.

3 Research Methodology

Mitchell and Jolley (2001) concluded that there are three important criteria for research design, they are internal validity, external validity and construct validity respectively. Internal validity mainly refers to whether there is really causality relationship existed. External validity refers to whether the findings from small sample can be generalized to a much wider population and what is the extent. Construct validity is that whether the operational definition really reflect what it wants to reflect. These three issues are very important to research methodology selection, so this study should consider all methods' advantages and disadvantages in order to decide the methodology this study will use.

In practice, there are four main research methods are used frequently, they are classical experiment, quasi-experiment, survey research and case study research. But after some literature review on these specific research methods, one conclusion can be obtained, is that there is no single one is flawless, so base on the three important validity issues, single one method cannot solve the research questions accurately, so the triangulated research strategy will be adopted in this research. This research will mainly focus on three research questions:

1. What are influential factors of strategic partnering in Chinese construction industry?

2. How do those influential factors influence the successful implementation of strategic partnering, positively or negatively, and their relative significance?

3. What is the relationship between strategic partnering and project success?

So this research will mainly use postal questionnaire survey to obtain quantitative data and, structure interview will also be used to supplement qualitative findings to confirm the findings got in the questionnaire survey. Using survey there are some important issues should be done to guarantee the survey quality (Fowler, 2002; Mitchell and Jolley, 2001):

1. Ensuring the survey instrument is sufficient in detail and scope, and focuses on the objectives of the study;

2. Ensuring the questions are clear, intelligible, logically sequenced, and can match the knowledge of those target respondents;

3. Paying more attention to the potential of those biases, such as sampling bias, interviewer bias and subject bias.

The constructs should be examined in the questionnaire are listed in the following, including cooperation, organizational justice, job satisfaction, affective commitment, loyalty, legitimacy, status, organizational identification, team climate and

instrumentality, this research wants to use these ten constructs to measure whether they have influences on the implementation of partnering, relatively or negatively and, the extent they exert on strategic partnering. There are also some important theories relevant to these constructs, they are social exchange theory, social identity theory and expectancy theory respectively, important items can be found in these theories to measure these constructs. In addition, this research will use other four constructs to measure project success, they are project efficiency, client's satisfaction, business success and, preparing for future, each have some specific sub-items to be measured. In the past, only visible and tangible constructs considered to be used to measure project performance, some important invisible and intangible constructs were ignored, but these constructs are even much more important than those visible ones in the current construction environment, so this research should pay the same attention to both visible and invisible constructs. Project efficiency and client's satisfaction are focus on short-term consideration. Business success preparing for future refer to the extent that project performance influence on the whole company business development, is long-term consideration, so these four constructs make the measurement of project success much more completed.

So, first, pilot study is needed to be done, because it can test the survey instrument before using it on a much larger scale and can reasonably ensure those above important issues are achieved. And it can also test whether the questionnaire can be used in Chinese construction circumstances, and the items used to measure the variables are applicable and suitable in Chinese construction industry. Then, some items will be modified or excluded and the final version of the survey will be decided. The questionnaire design will follow the general guidelines for postal surveys (Fowler, 2002). The instrument should be printed as an A5 booklet to fit a 110mm x 220mm return envelope, and the mailing label including return address and a tracking code should be affixed onto each return envelope. In addition, an information sheet should be also provided in the first page of the booklet, the details are in the following: particulars of the researcher, purpose of this research, nature of questions, voluntary nature of participation, need for accuracy and assurances of confidentiality, approximate time to complete and send back the questionnaire, reporting of findings. The instrument should be titled to reflect the aims of the research.

Second, after the completion of pilot study, some companies in Chinese construction context will be selected to join in the survey. In Chinese construction industry, depending on some important indexes of the companies, such as business years, both personal and equipment technical strength, fixed assets and annual production output, the companies can be categorized into four classes, respectively named Superfine class, First class, Second class and Third class. According to the information got from the website of Ministry of Housing and Urban-Rural Development of China, there are about 150 Superfine class construction companies. The companies will be selected from these Superfine class companies and then contacted to see whether these companies want to participate in this survey, and the questionnaires will be sent to them via mail after they agree to join. The reasons why these companies are selected are that they play the important role in Chinese construction industry, they are in the front of the industry and practice many fresh management concepts, they are well organized and some important data can be relatively more easily to get. A period of time will be given to complete the questionnaires and then the questionnaires will be sent back via mail. This study maybe distributes 500 questionnaires.

After the main questionnaire survey, some senior managers in these companies will be selected and interviewed to get important qualitative findings to confirm what had obtained from the questionnaire survey. Interview is a dynamic, in-depth and moderated process between interviewee and interviewer, each interview session will be followed with the prepared script and, the whole process will be captured in both notes and digital recordings, after interview these notes and recordings can be transcribed and analyzed.

Finally, data analysis will be conducted to analysis those received quantitative data from questionnaire and qualitative findings from interview. The main statistical methods will include multiple linear regression analysis, factor analysis, principal component analysis, Varimax rotation analysis, and so on. And the qualitative analysis will use the famous software NVivo to analyze the interview data to generate important findings to further certify the findings from the questionnaire survey.

4 Findings and Discussion

In current stage, there is no valid data for this research, so in this section research questions and the selection criterion of both the influential factors of partnering implementation and the measurement of project success will be discussed.

4.1 Research Questions

In this research, the main focus will centre on the following research questions:

1. What are influential factors of strategic partnering in Chinese construction industry?
2. How do those influential factors influence the successful implementation of strategic partnering, positively or negatively, and their relative significance?
3. What is the relationship between strategic partnering and project success?

4.2 Factor selection criterion

4.2.1 Selection for influential factors of partnering implementation

After literature review some factors can be found crucial for project success. Brooker and Lavers (1997) pointed out that the construction sector is full of disputes, which always cause cooperation is too limited to make project successful, and there are some scholars perceived that cooperation in the construction industry is the important foundation of project success (e.g., Latham, 1994; Bennett and Jayes, 1995, 1997; Barlow, Cohen, Jashapara and Simpson, 1997). In addition, cooperation in construction industry can facilitate the implementation of partnering relationship, base on its philosophy that a commitment to cooperate in order to achieve the total business goals and project objectives much more efficiently (CII, 1991; Latham, 1994; Bennett and Jayes, 1995, 1997), so cooperation between all the contracting parties can move the parties from traditional adversarial confrontation to friendly and cooperative relationship, and further leads to perfect project performance and project success. According to Tyler and Blader (2000) and Colquitt (2001), the concept of

organizational justice is an index used to assess the status of those groups in the organization and the status of those practitioners in the groups, and fairness and equity are principles of justice, practitioners consider justice important to project performance, because no one will commit themselves to the organizations if they feel there are unfairness and injustice in the organizations.

In addition, people's attitudes will determine what people like and unlike, so some researchers pointed out that affective commitment and loyalty are two important attitudes that can influence people's cooperation (e.g., Angle and Perry, 1981; O'Reilly and Caldwell, 1981; O'Reilly and Chatman, 1986; Allen and Meyer, 1990; Tsui, Egan and O'Reilly, 1992). Meyer and Allen (1997) considered that affective commitment is a positive affective attachment to the groups, and O'Reilly and Caldwell (1981) treated loyalty as a desire and intention to keep the relationships with the people in the group. So both affective commitment and loyalty can motivate people to cooperate well to make contribution to project success. Legitimacy is other important value to cooperation, is people's feeling of responsibility to comply with the rules in the organizations, and Tyler and Blader (2000) perceived that people will become self-regulatory and cooperative only when they evaluate the processes and people as legitimate, otherwise they will not cooperate and it will has bad impact on project performance.

Job satisfaction is a variable that links to a number of organizational outcomes (e.g., Smith, Organ and Near, 1983; Brief, 1998; Tyler and Blader, 2000), so it can also be considered as an important factor to measure project performance. Base on social identity theory, group status (pride), membership collective self-esteem and organizational identification, all have positive influence on project success. O'Reilly and Chatman (1986) indicated that all the practitioners concern about group status (pride) and their status in these groups (membership esteem), these two constructs can motivate people to have a good attitude towards their jobs and are beneficial to project performance. And organizational identification can lead to an affective commitment to the organization and people's behavior performance.

Team climate is also considered as an important factor which influence intergroup bias, organizational effectiveness and cooperation (e.g., Gaertner, Dovidio, Anastasio, Bachman & Rust, 1993; Anderson and West, 1998; Pettigrew, 1998). Colquitt (2001) pointed out instrumentality is the linkage between high performance and incentives. If there is unfair linkage between performance and rewards, it will discourage people to cooperate well and hamper projects to be successful. Global self-esteem refers to the overall evaluation of one's own value, and many researchers had done empirical tests to measure this construct's significance on project success (e.g., Rosenberg, 1965; Robinson, Shaver and Wrightsman, 1991; Tyler and Blader, 2000).

Wagner (1995) thought the individualism-collectivism construct can be used to measure whether people or group interests have precedence in their behaviors or their intentions, and it can shape cooperative behaviour on construction projects, so it is added to the factors to be tested to see whether there is influence on project success.

In brief, these potential factors are all drawn from the literatures and applied in different construction contexts, and they are applied and succeeded separately. The question is whether they are all applicable and suitable in the Chinese construction context should be examined first by using a pilot study, to ensure actually what

factors have influence on the implementation of strategic partnering on the China mainland. So the list of the potential factors may be shortened and used in the final questionnaire after the pilot study.

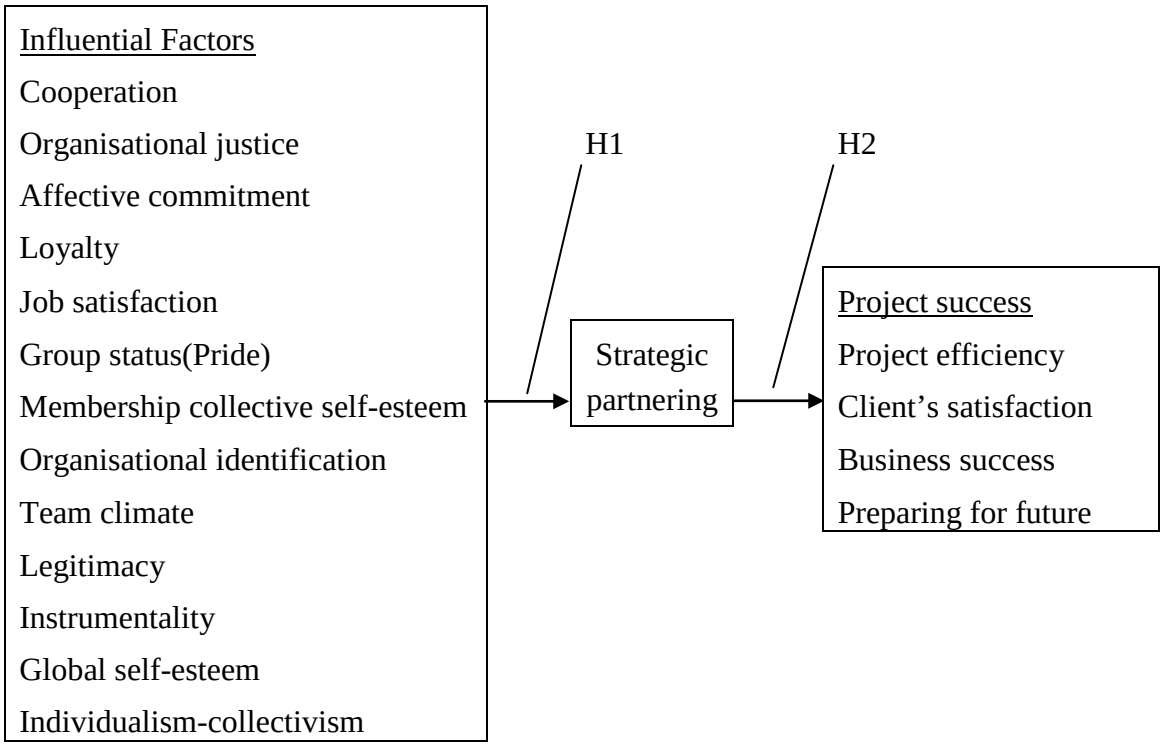
4.2.2 Selection for dimensions of project success

Defining and measuring project success is traditionally mainly associated with time performance, cost performance and quality performance. But after the development of construction industry and relevant literatures of project success in other industry sectors, it can be found that the traditional measurement has become insufficient. Actually projects are considered as part of the strategic management in organizations, so project success should be measured from multi-dimensions. According to Shenhar, Dvir, Levy and Maltz (2001), four dimensions for measuring project success are obtained and modified properly for suitability of construction sector, they are project efficiency, client's satisfaction, business success and preparing for future respectively.

The first dimension is similar with the traditional measurement, it is basic measurement of project success, it has three specific measures, cost, time and quality, they are vital to all kinds of projects. The second dimension is about benefits to client, in the large and complex projects, except for a standard product, clients need functional solution much more eagerly to their new needs, so sometimes clients pay more attention to this dimension than the first one. Traditionally the benefits of projects to their organizations are focused on profits, market share and other high level business related outcomes, so the third dimension is about the business success, focuses more on the improvement of business success with the organization as a whole brought by the specific projects. The fourth dimension is related to long-term benefits, it considers the question: how does the current projects help prepare the organization for future development. These four dimensions incorporate both short-term and long-term considerations, "hard assessment" and "soft assessment".

4.3 Research Hypotheses

Base on the research questions and selection criterion discussed above, two major hypotheses are presented, the first one has 13 sub-hypotheses, and the second one has 4 sub-hypotheses.



Hypothesis 1: Important influential factors have positive influence on the successful implementation of partnering.

Hypothesis 1.1: Cooperation is positively correlated with partnering success.

Hypothesis 1.2: Organisational justice is positively correlated with partnering success.

Hypothesis 1.3: Affective commitment is positively correlated with partnering success.

Hypothesis 1.4: Loyalty is positively correlated with partnering success.

Hypothesis 1.5: Job satisfaction is positively correlated with partnering success.

Hypothesis 1.6: Group status(Pride) is positively correlated with partnering success.

Hypothesis 1.7: Membership collective self-esteem is positively correlated with partnering success.

Hypothesis 1.8: Organisational identification is positively correlated with partnering success.

Hypothesis 1.9: Team climate is positively correlated with partnering success.

Hypothesis 1.10: Legitimacy is positively correlated with partnering success.

Hypothesis 1.11: Instrumentality is positively correlated with partnering success.

Hypothesis 1.12: Global self-esteem is positively correlated with partnering success.

Hypothesis 1.13: Individualism-collectivism is positively correlated with partnering success.

Hypothesis 2: Partnering is positively correlated with project success.

Hypothesis 2.1: Partnering is positively correlated with project efficiency.

Hypothesis 2.2: Partnering is positively correlated with client's satisfaction.

Hypothesis 2.3: Partnering is positively correlated with business success.

Hypothesis 2.4: Partnering is positively correlated with preparing for future.

5 Conclusion and Further Research

This paper presents some work of an interesting research topic, and it is really in the beginning stage, so the following job is to collect data and analyze those qualitative and quantitative data, and to find out some important result to contribute to this field and facilitate successful project implementation, so research aims and objectives are listed in the following:

5.1 Research Aim

To investigate real condition of partnering implementation on the China mainland, and give impetus to the further successful implementation of partnering in order to contribute to construction management development in Chinese construction industry.

5.2 Research Objectives

1. To identify the potential influential factors in Chinese construction industry.
2. To find out the real relationship between influential factors and partnering success in Chinese construction industry.
3. To determine the actual influence of partnering on project success in Chinese construction industry.

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A study of supply chain management in the Malaysian construction industry

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Abstract:

The construction industry is a complex and dynamic industrial sector. Malaysia, as a developing country, considers the construction industry as one main contributor of the country's Gross Domestic Product (GDP). Due to the combination of problems and issues that have recently arisen in current construction methods, such as time delay, rising costs in raw materials, lack of communication and coordination, inefficient management, and many other problems, the government has come out with a new solution through an industrialisation technology called Industrialised Building System (IBS). However, after five years of implementation in the Malaysian construction industry, the acceptance level of IBS is still below government expectation. Supply chain management (SCM) is very much covered in the more glamorous industrial sectors such as electronics and manufacturing, and has the potential for improving and solving these problems. In-line with investigating this effort, this research paper aims to provide alternative solutions in addressing these problems. A survey of the current industry and application of SCM that fits in this industry needs to be performed. This research hopes to answer these problems and help toward the betterment of the construction industry in order to enhance the implementation of IBS in the Malaysian construction industry.

Keywords:

Industrialised Building System (IBS), Malaysian Construction Industry, Supply Chain Management

1 Introduction

The construction industry is one of the main contributors of the country's Gross Domestic Product (GDP), both directly and indirectly, through the many mega-projects and infrastructure that are implemented in the country. In Malaysia, the construction industry plays a very important role to provide adequate, quality, and affordable homes, facilities, and infrastructures as part of the development of the country. The Malaysian government has invested a large sum of money in the country's expenditure to transform the country from a developing into an industrialised country by the year 2020. Statistics show that between years 1995 to 2020, Malaysia will need a total of 8,850,554

houses, including 4,964,560 units of new housing to cater for an increase in population during this period (Yoke *et al.*, 2003). Based on the 9th Malaysia Plan report, the country is expected to construct 709,400 new housing units for its population, where 270,991 units or 38.2% are planned for the low and low-medium cost houses, whilst 438,409 units or 61.8% of these will be medium and high cost houses.

In line with this, the Malaysian government launched a new construction policy under the Construction Industry Development Board (CIDB), which shifted toward industrialisation programmes called the Industrialised Building System (IBS). The implementation of this policy is guided by the IBS Roadmap 2003-2010 (Hussein, 2007) and has become a viable solution for addressing the increasing housing demands (Trikha, 1999; Din, 1984). According to the IBS Roadmap 2003-2010 (CIDB, 2003a), the role of the contractor in the conventional construction method will shift from the previous actor as builder to the installer in the IBS project. As a consequence, main contractors become more and more reliant on other actors in the construction supply chain (e.g., suppliers and subcontractors) to ensure time delivery as well as meeting other project requirements (Faizul, 2006). Therefore, they need to revise their supply strategies and trading relations with these subcontractors and suppliers. All these scenarios are related to the supply chain management system and the reason why this research has to be generated in the Malaysian construction industry.

The overall mission of this research is to establish the best practice model for supply chain management of the Malaysian construction industry, where supply chain is known as a cross-functional approach to manage the coordination and collaboration among channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. Therefore, the primary objective of this study is to evaluate the current practice of supply chain management in the construction industry that could fit in the value chain system which would enhance the efficiency and quality of construction projects. To accomplish this mission, several specific objectives of the study were identified, as follows:

1. to identify and develop SCM best practice models from literature;
2. to compare the best practice SCM models above with the current SCM related activities in the Malaysian construction industry;
3. to highlight the gaps found (outcome of objectives 1 and 2);
4. to identify issues and problems, based on the gaps, associated with SCM practices in the Malaysian construction industry; and
5. to provide a model recommendation for improvement of SCM practices.

2 Literature Review

2.1 Overview of the Malaysian Construction Industry and Supply Chain Issues

In Malaysia, the construction industry has played a crucial role in the overall economic development. Over the last 20 years, this industry has been consistently contributing between 3% to 5% of the national GDP (Hamid and Sarshar, 2003). The growth of the industry was further enhanced by the implementation of “Vision 2020” in 1991. This

vision is the country's long-term goal which aims to transform the country into a developed and industrialised nation by the year 2020.

Issues such as delay, abandonment, or low quality outcomes of projects have become a common scenario in this industry. For example, delay is considered a major cause of construction claims and there have many construction projects that suffer from delay (Abdul-Rahman *et al.*, 2006). Delay is attributed by many factors stemming from either from owner, designer, or contractor. In the case of projects that do not achieve the owner expectations, the process of redesign by the consultant (designer) will happen, thus the completion of work by the contractor is also delayed. Orr and McKenzie (1992), Pardu (1996), Clarke (1999), and Hartman (2000) all agreed that lack of proper communication is one major reason for failure of many projects that do not meet the set expectations.

The study by previous researchers identified others factor that contributed to the problem of delay, either at the site which can cause shortage or late supply of information, equipment, and materials (Potts, 1995); lack of funds or other resources (Abdul-Rahman et al., 2006), and lack of communication and coordination between parties or players (Che Mat, 2006). Other causes of delay are attributed to improper management of materials, hampered by lack of an explicit and detailed model of the project materials management process (Naief, 2002) and due to lack of skillful management where less attention is paid to resources allocation, e.g. human, financial, and material resources (Frimpong et al., 2003). These issues are basically related to how people, technologies, and processes have been effectively managed by these industry players starting from upstream to downstream activities.

2.2 History of Supply Chain Management (SCM)

The concept of SCM originated and flourished from the manufacturing industry. SCM had first perceptible signs in the Just In Time (JIT) delivery system as part of the Toyota Production System (Shingo, 1988). The aim of this system is to regulate supplies to the Toyota motor factory just in the right-small-amount, just on the right time with the main goal being to decrease inventory drastically, and to regulate the supplier interaction with the production line more effectively (Vrijhoef and Koskela, 1999). The applications of supply chain management techniques in manufacturing environments have saved hundreds of millions of dollars while improving customer service (Arntzen *et al.*, 1995).

2.3 Definition and Concept of SCM

The term of "supply chain" or "logistics network" is defined as a system of organisations, people, technologies, activities, information, and resources involved in moving a product or service from the supplier to the customer. Further definition of supply chain has been defined as "the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer" (Christopher, 1992), or simply as a system through which organisations deliver their products and services to their customers (Poirier and Reiter, 1996). Nelson (2003) defined supply chain as a "complex network or system of interconnected and

interdependent individuals, groups, companies, organisations and relationships whose goal is to satisfy and add value to their particular customer".

The term Supply Chain Management (SCM) was developed in the 1980s, to express the need to integrate key business processes, from end-user through the original suppliers. Generally, the SCM term reflects the process of planning, implementing, and controlling the operations of the supply chain as efficiently as possible. SCM spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption (Udin *et al.*, 2006). The other definitions of SCM are given in Table 1 below.

Table 1. Definitions of SCM

Sources	Definitions
Gattorna and Walters (1996)	"A loop that starts and ends with the customer, where through the loop flow all materials and finished goods, all information and all transactions"
Bechtel and Jayaram (1997)	"SCM is related to the flow of materials and information, from initial sources to the transformation process before delivery to the end-users."
Lambert *et al.* (1998)	"SCM is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders"
Mentzer *et al.* (2001)	"SCM is defined as the systematic, strategic coordination of the traditional business functions and tactics across these business functions within a particular company and across businesses within the supply chain, for the purpose of improving the long-term performance of the individual companies and the supply chain as a whole"
CLM (2004)	SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers and customers. In essence, SCM integrates supply and demand management within and across companies.

2.4 Definition of Industrialised Building System (IBS)

Industrialisation is a process of social and economic change whereby a human society is transformed from a pre-industrial to an industrial state (CIDB, 2003a). It is a part of a wider modernisation process through the technology system. There are a few definitions of Industrialised Building System (some of the researchers called it mass production or off-site construction) which have been progressively developed over many years by the previous and current researchers. According to Chung and Kadir (2007), IBS was defined as a mass production of building components either in a factory or at the site according to the specification with standard shape and dimensions, and transport to the construction site to be re-arranged according to a certain standard to form a building. While IBS is defined as a construction process that utilises techniques, products,

components, or building systems which involve prefabricated components and on-site installation (CIDB, 2001), the components of IBS are manufactured either in a factory, on or off site, positioned, and assembled into place with minimal additional site work (CIDB, 2003a). According to Dietz (1971), IBS is defined as a total integration of all subsystems and components into the overall process while fully utilising industrialised production, transportation and assembly techniques. Whiles Parid (1997) defined IBS as a system which uses industrialised production techniques either in the production of components or assembly of the building, or both. Others definitions of IBS are highlighted in Table 2.

Table 2. Definitions of IBS

Sources	Definitions
Lessing *et al.* (2005)	"An integrated manufacturing and construction process with well planned organisation for efficient management, preparation and control over resources used, activities and results supported by the used of highly developed components."
Trikha (1999)	"A system in which concrete components prefabricated at site or in factory are assembly to form the structure under strict quality control and minimum in situ construction activitiy."
Warszawski (1999)	"A set of interrelated element that act together to enable the designated performance of the building"
Esa and Nurudin (1998)	"A continuum beginning from utilising craftsmen for every aspect of construction to a system that make use of manufacturing production in order to minimise resource wastage and enhance value end users."
Junid (1986)	"An industrialised process by which components of a building are conceived, planned, fabricated, transported and erected on site includes a balanced combination between the components of software (elements provide a prerequisite to create the conducive environment for IBS to expand) and hardware (three groups of elements: frame or post and beam system; panel system; and box system). "

2.5 Classification of IBS

There are five main groups of IBS identified by CIDB (2003b). The categorisation of the groups is based on the structural classification used in the Malaysian construction industry. There are:

- **Pre-cast Concrete Framing, Panel, and Box Systems**
  - Pre-cast column, beam, 3-D components (balconies, staircases, toilets, lift chambers), permanent concrete formwork.
- **Steel Formwork Systems**
  - Tunnel forms, beams and columns moulding forms, permanent steel formwork.
- **Steel Frame System**

- Steel beams and columns, portal frames, roof trusses.

- **Prefabricated Timber Framing Systems**
  - Timber frames, roof trusses.
- **Block Work System**
  - Interlocking concrete masonry units (CMU), lightweight concrete block.

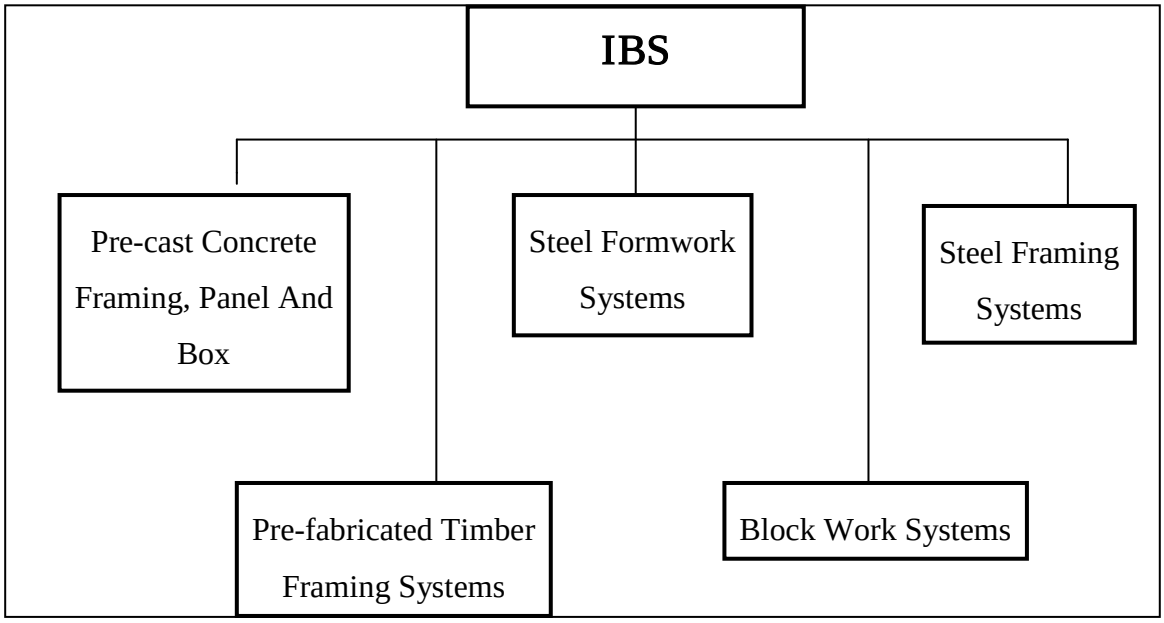

Figure 1. Graphical group of IBS
(Source: CIDB, 2003a)

3 Research Methodology

According to Remenyi *et al.* (1998), research methodology refers to the procedural framework within which the research is conducted and there are many factors to be considered when choosing an appropriate research methodology. This study will be carried out using a combination of research methods involving both exploratory method and field survey approaches. The exploratory work will be done through focus group study, based on structured and semi-structured questionnaires of selected relevant participants as well as extensive literature search through the various academic databases. However, this on-going research is still at the initial stage, therefore, the information presented in this paper is primarily based on the thorough review of the relevant literature within the scope of supply chain management. Wisconsin (2008) identified that a literature review is a "critical analysis of a segment of a published body of knowledge through summary, classification, and comparison of prior research studies, reviews of literature, and theoretical articles". There are six elements of a literature review comprising a list, a search, a survey, a vehicle for learning, a research facilitator, and a report (Bruce, 1994). Through the literature review, the definition, concept, history, application, and related issues of Supply Chain Management (SCM)

and Industrialised Building System (IBS) in the construction industry is examined and highlighted. All the data and information gathered directly from libraries, articles, books, and other printed materials searched from the Internet. This literature review is very important and helpful in the process of developing for the theoretical sections of the actual research.

4 Findings and Discussion

This paper has covered the current situation of the construction industry in Malaysia, the government initiative, and related issues faced by the players within the industry. SCM involves the integration of three key flows across the boundaries of the companies in a supply chain – product/materials, information, and finance/cash whereas this concept can be applied and focus to the management of construction activities on site instead off-site. Successful integration or coordination of these three flows has produced improved efficiency and effectiveness for companies. The key factors for a successful implementation of SCM include inventory, cost, information, customer service, and collaboration relationship management. Focusing on the management of these factors is critical to the implementation of a supply chain strategy. Apart from that, this research will make some investigation into the transformation from the old supply chain model to the new supply chain model with the main aim of enhancing the application of the IBS method for the Malaysian construction industry.

5 Conclusion and Further Research

This study will not only improve the competency of the key players in the construction industry, but will also contribute to the development of best supply chain management practice that is crucial for the success of this industry. As mentioned in introduction earlier, IBS is one of the new construction methods as introduced by the government to enhance the value, quality, and productivity performance of the Malaysian construction industry. However, the plans and strategies of implementing the IBS technology should be emphasised more, especially in the aspect of communication or coordination among construction players which not only involving the general coordination on design, procurement and delivery timelines but have to concentrate also on the detailed manufacturing and logistics issues. A part from that, the study of the level of the technology and skill of readiness among contractor companies (or better known as Small and Medium-sized Enterprises - SMEs) must be put as a priority for future study too.

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Theme 4

ICT, Technology and Engineering

Building Information Modelling (BIM) System in Construction In 2020: Opportunities And Implications

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Abstract:
Information Technology (IT) is an essential catalyst for effecting improvements in the construction industry. Despite the growth and acceptance of IT in the industry, construction remains slow to adapt the capacity of change proffered by Building Information Modelling (BIM) and exploit the diverse range of opportunities this IT innovation promises. This study explores the trends, applications and opportunities of BIM in construction in the 21st century with projections to 2020. The implications of these opportunities are also reviewed; possible constraints and challenges are also identified. Finally areas for further research are explored.

Keywords:
Building Information Modelling (BIM), construction, construction product, Information Technology, virtual enterprise

1 Introduction

An effective design process is very critical to the success of construction processes (Aish 1999). Moreover, the adoption of applications of information technology (IT) has been a significant part of major developments in several components of the global economy. The benefits are evident in monetary and non-monetary terms in industries like Aerospace, Manufacturing, Architecture, Engineering and Construction (AEC), Health, Education, Agriculture and services' industries. Although, the rate of adoption of IT innovations differs within these industries, there is overwhelming evidence about how the applications of IT could foster process improvements. These benefits are not limited to time and costs savings, they also limit risks and uncertainties in construction processes (Sarshar et al., 2000). Apparently, the construction industry is being challenged by some barriers regarding the adoption of few recent developments in the industry. These barriers are related to extrinsic and intrinsic constraints that closely associate with the nature and peculiarity of construction products, culture, level of risk, uncertainties and systemic complexity of the construction industry. In addition, some other constraints can be relative to the different perceptions about the implications of the adoption of BIM on the future of some professional roles in construction processes.

Several efforts have been made by some authors to provide comprehensive definitions of BIM (French and Fischer 2000; Schwegler, Fischer et al. 2001; Tse, Wong et al. 2005; Lee, Wu et al. 2006; Kazi, Hannus et al. 2007; Norbert W.Young (Jnr), Stephen A. Jones et al. 2007; Tarja Häkkinen, Sirje Vares et al. 2007; Robert P. D. and Susan 2007 ; Gu N., Singh V et al. 2008; Guillermo Aranda-Mena, John Crawford et al. 2008; Succar 2008; Gu, Singh V. et al. 2008). Evidently, BIM means different things to different people. Thus, BIM could have different definitions due to its flexibility and multiple applications. Schwegler et al (2001) define BIM as the process of creating an information database for a project. This is not limited to the presentation of designs in at least three dimensions (3D), it also represents the use of lifecycle information in an interoperable manner to create, engineer, estimate, illustrate and construct projects. Furthermore, relating this definition to other attempts, BIM could be referred to as computer-aided drafting and design (CADD) techniques and allied technologies, which extend beyond rendering designs in 2D or 3D with lines, arcs, splines and other rigid "unintelligent" features. It includes the procedures and frameworks for enhancing object-oriented productivity and creativity in design processes through simultaneous creation, access, management, storage, use, update and sequencing of both geometric and non-geometric data on building components to simplify information management on project life-cycle. The baseline, however, is that BIM facilitates interoperability within the project team such that conflicts and insufficient information could be eliminated within communication and design processes.

Interestingly, there is significant evidence indicating BIM as having unprecedented capacity to drive efficient changes in construction history. (RiverGuide 2006) argues BIM as a nascent idea in construction, the realization of which is many years out. Guillermo Aranda-Mena, John Crawford et al. (2008) and (Succar 2008) provide holistic description of the trend of BIM adoption and implementation in different parts of the world. Probably, due to reluctant features of the industry regarding the adoption of BIM, there are several misconceptions concerning the trend of CADD developments and the capacities of BIM. This study is aimed at exploring the opportunities and implications of BIM applications. The objectives are: (1) to define the trends of growth in CADD and BIM in construction, and; (2) to project the opportunities and challenges that BIM system is likely to stimulate in the construction industry by year 2020.

2 Product Information Modelling and Implications of IT in Construction

The construction industry relies on the effective application of complex and multidisciplinary, but project-specific, information to achieve result in its product development processes (Abbott, Martins et al. 2007). However, designers are often faced with the challenge of inadequacies associated with the capacity and quality of information that design tools could conveniently provide. This could be aggravated by imperfections in the structure of clients' requirements (Tarja et al., 2007). Unfortunately, with complex, dynamic and tersely informing technical briefs and exhaustive clients' requirements; project teams often require suitable and exceptional frameworks to initiate professional opinions with the capacity to effectively stimulate

construction processes beyond all odds, risks and uncertainties. Moreover, project teams are often expected by clients to conceptualize and deliver value-added professional opinions in project designing, engineering, estimating and planning with expressed information on building components. This role must be in adequate consideration of several indices of project performance; including buildability, flexibility, functionality, cost effectiveness and so on (Fusell, Beazley et al. 2007).

Severally, there is evidence in many parts of construction history from Stone Age to modern times showing that many techniques and tools had been used to drive project performance through enhanced design, estimating and planning. Arguably, manual and CADD systems are the most popular of these mechanisms. Although, both systems have made their impacts, there are marked limitations that were associated with each of them. These shortcomings relates to the inability of design processes to initiate frameworks that support comprehensive information on all project components and their applications. Also, there are concerns on these processes encourage effective communication, value integration and innovation across all disciplines in construction project teams. Therefore, the industry has been in dire need of quality design information management system that is appropriate to effectively motivate accuracy in system processing, engineering, estimating and responsibly forecasting project targets in relation to quality value and time. The purpose of this drive is to limit project risks and uncertainties across the entire project life. Evidently, the incapacity of design systems to address these indices translates into major challenges in construction processes.

On the one hand, the manual design system and procedure lack the capacity to adequately and concurrently capture and present geometric and non-geometric information on design components. It is also time consuming and expensive to generate, manipulate, store and exhaustively apply underlying information on project components. Other challenges of this design system include timeliness in its capacity to facilitate simultaneous access, integration and collaboration of design teams across several multidisciplinary boundaries. The effects of these inadequacies of manual design system could translate as major challenges in construction processes. Among such challenges having far-reaching effects on project delivery include design delays, omissions, mistakes, errors, conflicts and lack of capacity to facilitate comprehensive information on project components as well as store same for onward transmission. Most times, projects are finished with less value than anticipated, if not abandoned. Moreover, its purpose could be derailed with cost overrun, project delay, disputes and crisis. Unfortunately, the challenges of project performance in the construction industry are mostly blamed on inadequacies of design processes to initiate integrative construction process without errors, omissions and conflicts (Latham 1994; Egan 1998 ; Koskela 2000; Hansen and Vanegas 2003; Gorse and Emmitt 2004 ; Gruneberg and Hughes 2006). Thus, an alternative design method is imperative – at least to facilitate adequate capacity and sophistication that would enhance design process in terms of accuracy, timeliness, cost effectiveness, value integration and ability to store robust information about project components.

Interestingly, the adoption of applications of information technology in construction has been an impressive alternative. Going by available historical data, the use of information technology dated back to 1931, long before the name ‘computer’ was adopted for ‘thinking machines’. CADD applications were used in Massachusetts

Institute of Technology (MIT), United State of America. They were run on Intergraph, Accugraph, MacDonal Douglas GDS with IBM, Prime, Digital VAX, and SUN systems and Unix, and later on less comparative (in terms of strength) MS-DOS; with mainframe and min-computers. They were later used on micro-computers and IBM-PCs in 1976 and 1981 respectively (Langdon 2002). Until 1982, most CADD cost US$40,000 or much more. Table 1 shows the trend of CADD developments in construction from 1931 to 2008.

Year	Events	Notes
1931 – 1981	CADD applications were used in Massachusetts Institute of Technology (MIT), USA prior to modern "computer explosion" and the subsequent proliferation of contemporary CAD applications. CADD applications were then run on "turnkey" systems. They were later used on micro-computers and IBM-PCs in 1976 and 1981 respectively, using MS-DOS.	This precedes AutoCAD times. Intergraph, Accugraph, MacDonal Douglas GDS were run on IBM, Prime, Digital VAX, SUN systems and Unix. Generally, the cost of CAD applications was very expensive; sophisticated systems were required and the expertises to drive the systems were rare and expensive.
1982 – 1987	Different versions of AutoCAD (1.0, 1.2, 1.3, 1.4, 2.0, 2.1, 2.5 and 2.6) were released, each being marked improvements over previous editions. Initially, they were run on low capacity IBM-PC and later on micro-computers with most attributes still available in recent versions. Major 'add-ons' on previous versions include AutoLisp, Ketiv (ArchT), AutoArchitect (Softdesk), ArchPro, GeoCAD, DrawBase etcetera.	AutoCAD was demonstrated at COMDEX trade show. Although, 3D tools were part of the initial tools, overcoming 1-floor problem is a major constraint. The requirements' costs (software, hardware and personnel) were reduced. There were marked improvements in flexibility, user-friendliness, knowledge transfer and market growth
1988 – 1997	Releases 9, 10, 11, 12, 13 & 14 were introduced. There were major improvements on LISP, rendering and "paperspace" capabilities. Previous problems associated with compatibility of files created in various versions also solved. 3D Modelling was also enhanced through ACIS, while conversion of different units of measurement was made possible	There was notable capacity integration which enables AutoCAD to run on both Mac and Microsoft Windows computers. "xrefs' format enhanced collaboration and networking. Softdesk was absorbed, while Autodesk clients grew to a record 3,000,000 AutoCAD users.
1998 – 2002	ArchitecturalDesktop versions 1, 2, 3 and 3.3; and AutoCAD LT, AutoCAD 2000, 2000i and 2000iLT, 2002, 2002LT, ArchitecturalStudio and Autodesk Revit. Building component entities, AXR language, object enabler, internet-based interoperability were initialized.	The cost of AutoCAD went down tremendously. It is now possible to drag and drop 3D objects from the internet. Floor slabs were introduced as improvement over previous editions with 1-storey challenge. Revit was absorbed.
2004 – 2008	AutoCAD 2004, 2005, 2006 and 2007 were introduced. Support and upgradability of lower versions of AutoCAD discontinued as all versions are only available through subscriptions. AutoCAD components were invigorated to integrate 3D capabilities into smarter building system and initiate capacities for building cost analysis, automated components' specification documentation, structural engineering, space planning, facilities management and interference checking etc.	There are major improvements in design visualization, productivity (due to easy retrieval of information), increased coordination of construction documents, embedding and linking of vital information such as vendors for specific materials, location of details and quantities required for estimation and tendering, increased speed of delivery and reduced costs

Table 1: Trend of growth of AutoCAD in the construction history (Langdon 2002; Autodesk 2007)

Arguably, interpretations and conceptualizations of information technology in construction are broad and indexical. This mostly depends on nature of business and purpose for which it was put to use. Evidently, CADD systems improve the capacity of design processes through enhanced information management system, innovative processes, accuracy, time and cost savings. However, before the advent of BIM, there was wide gap between design accuracy and project performance within different periods of CADD applications. Designs were in 2D or 3D formats, mainly developed with geometric data only. Simultaneous access to design server, simulation, project visualization, virtual enterprise and other possibilities now being deployed in BIM were absent. Moreover, before Autodesk recently absorbed Revit in 2002, '1-storey limitation' and compatibility constraints were the major challenges in all Releases of AutoCAD. In fact, up to Release 14 of 1997, AutoCAD is largely 2D-based design system. In subsequent editions however, 3D enabler, 'intelligent object' components, internet compatibility features, AXR language were added to improve design visualization. 'Xrefs' were also added to improve networking and collaboration within the project team, while other benefits of this innovation multiply through interoperability and virtual enterprise. This marks the turning point hitherto upon which building information modelling (BIM) techniques were developed.

Due to certain factors, BIM started as marketing tool for few firms that were able to recognize its concept and business drivers. Others seem reluctant to adopt this tool because clients were not fully aware of its desirable capabilities and the benefits they stand to gain as value on their investment when BIM is deployed in their projects (Schevers, Mitchell et al. 2007; Olofsson, Lee et al. 2008). Perhaps, some vital organs of the industry could have been misinformed by some misconceptions arising from certain aspects of BIM applications' marketing backgrounds (Gu N., Singh V et al. 2008). Nonetheless, the construction industry seems not to fully understand the impacts of these failures on her image and the future of some professional roles and services. However, efforts are on-going by application developers, researchers and policy makers to improve the slow of BIM adoption and further define business factors that are inherent in BIM deployment (Lee, Wu et al. 2006; Fusell, Beazley et al. 2007 ; Gu, Singh et al. 2008; Guillermo, John et al. 2008; Succar 2008; Gu, Singh V. et al. 2008).

Interestingly, with earlier features of design manipulations (from 2D to 3D and 3D to 2D), project simulation, improved project visualization, automated design updating and innovative modelling are now better possibilities in BIM. Presently, BIM applications are being deployed to simulate construction project designs. With robust information bases underlying component objects, it has become easier to predict variable and major activities in project life. Possibly, in future, several alert systems are likely to be integrated into design models to sensitise developers, users and clients regarding use, overhaul and improved diagnostics. Moreover, while cognition and computing experts in CAD/BIM applications grapple with the challenge of embedding project components with robust information in form of detailed, functional, operational and application database in manners that are desired by other professionals, separate applications are still being deployed for cost estimation, specification writing, structural engineering, project planning, facilities management, wood framing, space planning, HVAC ductwork and interference checking, checking compliance with Building Code and so on (Robert and Susan 2007).

Conversely, recent evidence shows the benefits of BIM deployment in project planning (4D) and cost estimating (5D) (French and Fischer 2000; Nigudkar 2005). Arguably, there are further positive indicators supporting future effective applications of BIM regarding vital and multi-various motivations to drive business and innovation across all fields and disciplines. However, cost benefits of this advantage is more likely to be a major disincentive in the short run, while the cost of change promised by BIM could be huge in the long run. Evidently, design and construction processes are more likely to improve when stakeholders handle and deploy BIM as a tool of change, not just limited to design but including construction, planning, estimating, facilities management and advanced cognition and simulation to transact ideas with the true spirit of collaboration, mutual understanding, and effective communication and sustain integration, innovation and share values (Norbert et al., 2007).

3 Research Methodology

Studies on the adoption and implementation of BIM are being given overwhelming attention in several industry-focused technical reports. Being an emerging technology, information used for the projections on the growth of CADD and BIM applications are limited to data retrieved from BIM application developers, technical reports and recent de-facto discussions. However, as the rate of adoption of BIM improves globally, there could be further access to empirical data on improvements in the prospects of CADD and BIM applications. On the other hand, observations based on BIM opportunities and challenges are based on its theoretical capabilities. These include its ability to generate accurate automated quantity measurement and facilitate robust information database for product components. Others include the propensity to enhance virtual enterprise through product model visualization before construction and promote effective communication, interoperability, value sharing between parties, innovation and genuine spirit of collaboration and teamwork in the project team.

As part of an ongoing research, the aim of this study is to project the opportunities and challenges that are inherent in the adoption of BIM application by 2020. (Sarshar, Betts et al. 2000 ; Abdul Samad (Sami) Kazi, Matti Hannus et al. 2007) have used similar strategies to make projections for the deployment of IT applications in construction in the early years of the 21st century. The limitation however, is that these assumptions are not based on primary empirical data. Meanwhile, issues relating to historical documentation and projections such as this are of greater importance to construction students, researchers and application developers who would be willing to explore further possibilities with BIM application and its impacts on project procurement.

4 Prospects of BIM in Construction in 2020

Part of the modest desires of government and public is that the construction industry optimises its capacity to improve project delivery through construction processes. Latham (1994) observe that construction cost could be reduced by one-third if processes leading to project delivery improve. Interestingly, there had been various attempts to explore the role information and communication technology plays in driving innovation, cost benefits and improved value integration in the construction industry. Abdul-Samad Kazi et al, (2007) study the roadmap for the application and adoption of IT in the UK

construction industry. Moreover, Sarshar et al (2000) report the potential of IT in construction with projections that, by 2010, there could be a turning point in construction history. This timeline is expected to institutionize enhanced collaboration, integration, communication, teamwork, risk minimization through project's (model) pre-construction simulation, analysis and visualization as well as exceptional improvement in quality of service in terms accuracy, time saving, aesthetics, sophisticated and rigorous functional analysis of building components.

Moreover, there is wide gap between the already-achieved potentials of BIM and what has been achieved with Product Information Modelling processes of manufacturing industry. This challenge could be relative to the size of construction industry and the uniqueness of its products, compared to manufacturing sector. However, with the current wind of change promised in BIM, there are improved chances that the construction industry may no longer live by excuses relating to systemic complexities, product uniqueness, dynamism in clients' requirements and other limiting factors which impede project performance. Evidently, it is very unlikely that these barriers would be allowed to persistently hold the construction industry into ransom for ever (Hansen and Vanegas 2003; Norbert, Stephen et al. 2007). Efforts are being made by various institutions and governments to improve the adoption and implementation of BIM in many countries. These earnest desires for change are based on persistent pressure from governments, clients and members of public who have continued to show concern on the need to have better value-oriented, sustainable, energy-efficient construction industry where improvement of processes and procedures leading to project delivery in construction is inevitable. Figure 2 shows current BIM process network in construction project delivery.

Current opportunities promised in BIM include thorough integration of Architecture, Engineering, Construction, Time-line sequencing of planned schedules and Cost Estimating (5D) in a single environment. Incidentally, there are strong indications that, sooner that later, application of BIM would become more evident as revolutionized international benchmarks for project procurement in construction. While opportunities evolve to address some of the misconceptions regarding BIM applications, there are improved chances that BIM has the capacity to impact on the aggravating nuances of traditional construction methods. Further to these, many more of institutions and education providers are currently adopting teaching and research on BIM as part of their programs and structure for the future of the construction industry. The implication is that, in the next decade, further advances would be made into project visualization and simulation such that could embrace sophisticated technologies like automated alert systems in constructed facilities, robotics and manufactured construction. Perhaps, it could be possible to achieve building components - walls, doors roofs, floors, furniture that would alert users when servicing or change is due.

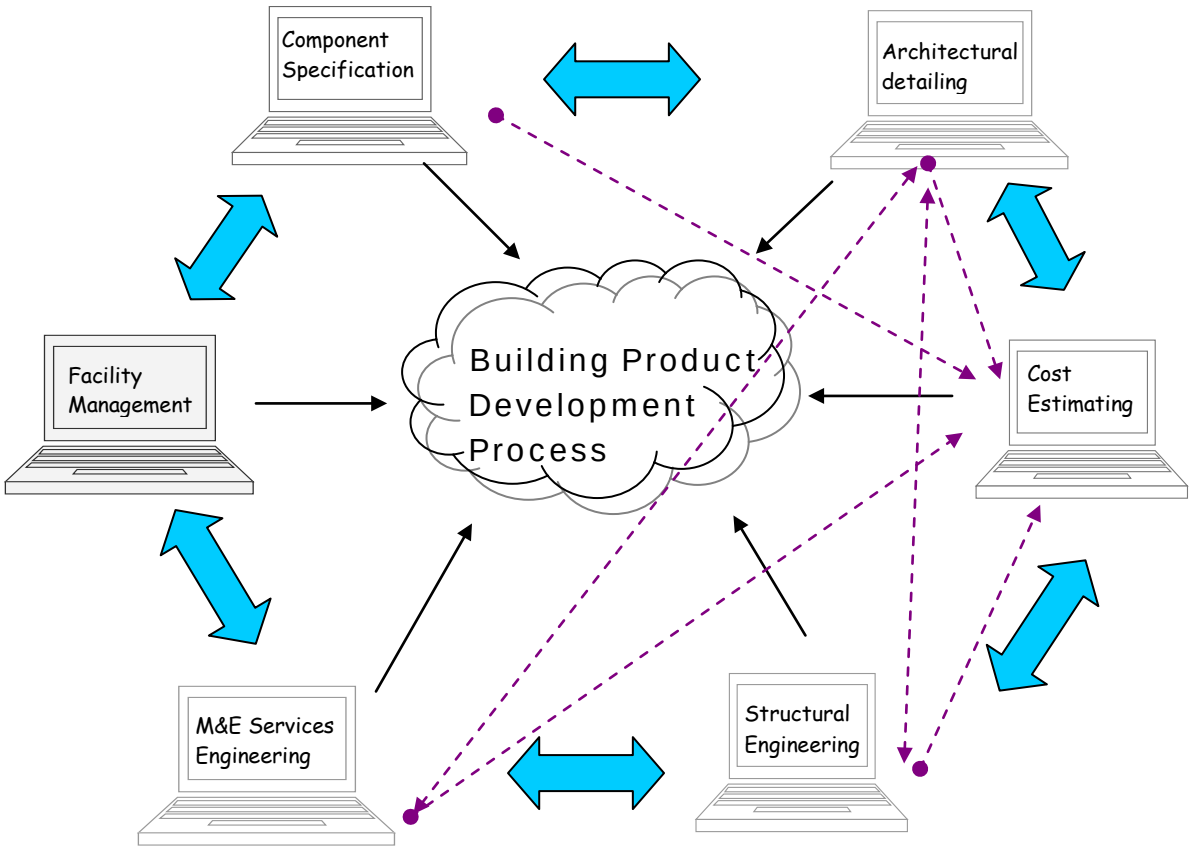

Figure 2: Communication mechanics in building information modelling (BIM) process

Conversely, while software developers are considering improving the compatibility indices of current 3D tools in use, conceptualising BIM to adapt to traditional procedures in the construction processes is a major challenge. Tse et al., (2005) report that the management of BIM procedure in design processes may become a new discipline in the future. Apparently, this is a possibility because, going by extensive drive for change and the implication on professional role, there could be inadvertent divide that would delineate professional roles in the industry according to technological capabilities. On the other hand, although, members of project teams reserve the responsibility to input their professional opinions as project-specific information in industry foundation classes (IFC) databases of projects, manipulating the IFC to conform to traditional procedures is another challenge (French and Martin, 2000). For instance, in traditional procurement procedures, cost consultants are used to using Standard Methods of Measurement (SMM) principles to generate Bills of Quantities (BoQs) and adapt same for cost analysis of projects. Unfortunately, filtering IFCs to conform to SMM ideals in generating cost estimates from automated quantities generated from IFCs has not been very easy (RiverGuide, 2006). However, in the next

decade, impacts of BIM on procurement practices and ethos would become more evident.

Furthermore, there is the need to establish the compatibility of BIM with other CAD tools that practitioners in the industry are familiar with. Arguably, substantial investments in construction are focused on applications that specific isolated roles like estimating, planning, structural analysis, facility management and so on. The challenge, however, include the strategy to continuously convince practitioners in this category that deploying BIM applications make business sense both at short and long runs. Another significant barrier of the adoption of BIM is comparativeness of cost benefits and associated trade-offs when BIM is deployed as substitute to CAD applications design practitioners are familiar with. The setback could be more serious when these software applications can perform better individually than BIM would do collectively. However, overcoming compatibility constraints should not be too difficult in BIM. This is because its developers, Autodesk Revit, have outstanding records of solving related problems over the years (Langdon, 2002).

5 Conclusion and Further Research

The construction industry develops its unique products using complex information from different sources. Thus, the use of sophisticated tools with appropriate capacity to process, manipulate and present product information in construction processes is inevitable. This limits risks and uncertainties as well as saves time and cost in construction processes. Although, the use of CADD applications started in construction around 1931, evidence of significant improvement promised in BIM applications started in 2002. However, despite the barriers of BIM adoption, its exceptional prospects are outstanding. By year 2020, BIM is expected to improve construction product development process through enhancements in process management, time and cost savings, facilitation of robust information database on product components, virtual enterprise and product model visualization, effective communication, interoperability, value sharing between parties, innovation and genuine spirit of collaboration and teamwork.

More direct impacts of BIM are evident as defragmentation between parties and project teams improve through interoperability and virtual enterprise. Arguably, as trade boundaries continue to diminish, role change is inevitable. Moreover, initial cost benefits at early stages of adoption may be in doubt, as firms may need to invest in procuring the appropriate hardware and software to drive BIM as well as train personnel for the new challenge. Evidently, there will be opportunities to adapt new skills in order to cope with new situations. However, this may imply that immediate cost benefits could be low, as firms need to prepare for some of the inevitable changes the adoption of BIM could bring. Consequently, there may also be the need to improve incentives for research on BIM. This includes appraisal of academic curricular in the short run in order to achieve the needed result about long-term framework for the improvement of project delivery in construction.

Finally, it is recommended that future research be focused on analytic evidence regarding empirical impacts of BIM on design process, procurement and professional

roles. Meanwhile, the prospects of BIM to institutionize integrated construction processes would continue to indicate that project could be delivered better, cheaper and safer, while defragmentation improves between parties.

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Technology Transfer Practices and Strategies: Issues for Nigerian Construction Organisations and for Research

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Abstract :
Technology transfer is increasingly being seen as an important issue for economic development and growth. Arguably, this is why developed and especially developing countries are very keen on technology transfer. However, there are those that contend that organisations in the Nigerian construction industry are not as engaged in technology transfer as many would like, and that potential benefits of doing so are not realized. In the same vein, the challenges that confront construction organisations in Nigeria in terms of technology transfer have received very little empirical studies. This paper, therefore, presents a thorough review of literature on strategic issues and choices that Nigerian construction organisations face in grappling with technology transfer, together with associated challenges. Consideration is also given to what technology transfer actually means to such organisations, and how this is viewed in line with other terms such as innovation. The paper argues and concludes that the challenges that confront construction organisations in Nigeria are multifaceted and likely to impact on their strategic choices. In the same vein, it is also argued that these have implications for researchers attempting to investigate technology transfer practices and strategies in construction organisations in Nigeria in terms of their choice of research strategy and design.

Keywords:
Nigeria Construction Organisations, Strategic choices, Technology transfer

1 Introduction

Technology transfer strategy is arguably not a common practice as technology transfer practices in Nigerian construction organisations. Technology transfer strategies have not been seen as a method of technology management in Nigerian construction organisations. The procurement method has a great impact on the strategy of technology transfer. For technology transfer strategy to be developed, a proper understanding of the term technology and technology transfer is required.

The term technology and technology transfer has been viewed to mean different things, but the authors recognized technology to mean skills, techniques and knowledge used to produce technological products and services. In recognition of the meaning of

technology and technology transfer, the authors adopted Li-Hua, (2006) study of strategy of technology transfer, in relation to Nigeria construction organisations. The authors also develop a conceptual model of technology and technology transfer processes.

The paper presents a thorough review of literature on strategic issues and choices that the Nigerian construction organisations face in grappling with technology transfer, together with associated challenges. Also, consideration is given to what technology transfer actually means to such organisations, and how this is viewed in line with other terms such as innovation. Must people misunderstand the term technology for finished products or innovation, this paper will attempt to clear these views. The term transfer will be looked at in this paper in order for us to understand the transfer process of technology.

2 Literature Review

Technology transfer has become a household name for researchers, businessmen and policymakers. Technology transfer cannot be discussed without knowing what technology actually means. Many a time people misunderstand the term technology for finished product or innovation, and the term transfer for movement of technology from one place to another. Technology transfer is arguably not of a linear nature. It is a matter of give and take (Farrukh and Probert, 2005). According to the Oxford English Dictionary, transfer means; move someone or something from one place to another. In this context, transfer is linear in nature, it is one dimensional.

Few academic studies have clearly defined transfer in relation to technology transfer. For this reason the authors attempt to define transfer in this context as the act of sharing or buying and selling of skills, knowledge & techniques for fund, economic development or/and competitive advantage. Table 1 shows the different descriptions of technology and the authors.

Table 1: Different Definitions of technology

Descriptions (Definitions of Technology)	**Authors**
Process of cultural change	Murphy, J.J. (1967) & Evans, D.E. (1984)
Application of physical, life and behavioral science	Jantsch, E. (1967)
Application of organized knowledge, skills and procedures	Galbraith, J.K. (1967) and Merrill, R.S. (1968)
Knowledge embodied in product and techniques	Schon, D.A. (1967), Penon, J.D. & Wallender, H.W. (1977), and Mansfield, K. (1975)
Practical & theoretical know-how, knowledge, tools, methods, products, procedure, skills, techniques and system	Khalil, T.M. (2001), Dosi, G. (1984), and Barquin, R. (1981)

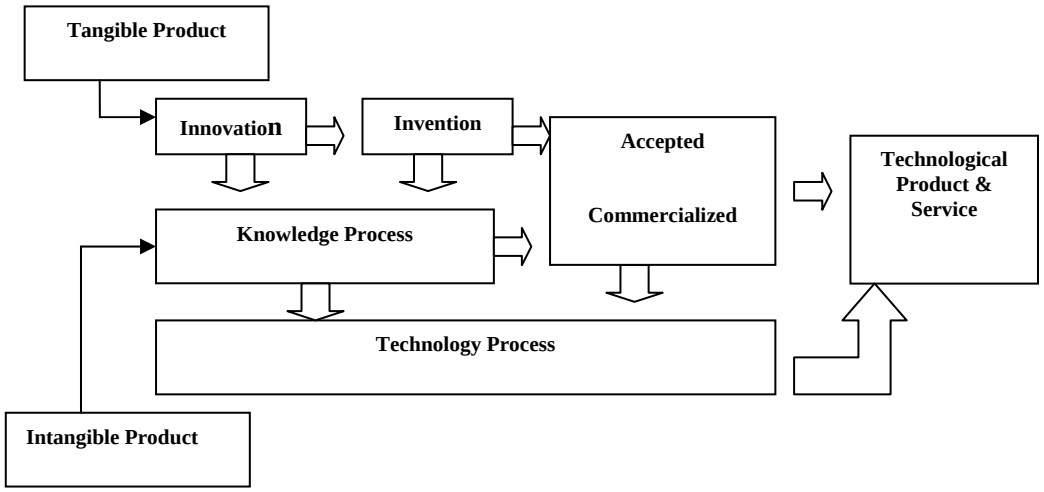
It is recognized that technology has a very broad meaning, but in the context of this paper, the authors define technology as the application of physical and theoretical skills, techniques & knowledge to produce a technological tangible or intangible product that

is acceptable or useful for better goods and services and could be commercialized if need be. From the definition, skills, techniques & knowledge are technology when it is acceptable and used to add value to goods and services. Skills, techniques & knowledge are technology when commercialized.

The choice of technology is affected by many factors. These factors include; the skills level of the transferee, the tacitness of the technology, political and policy factors of the transferee, available market, the level of technology (Advanced, Modern, or Obsolete Technology), transferee attitude, culture and infrastructure. These factors need to be considered to meet the full potentials of the chosen technology. The appropriate choice of technology is as important as the transfer of technology. Nigerian construction organisations need to choose technology that meets these factors for effective technology transfer.

Technology and innovation could be misunderstood. Innovation could be seen as the generation of new ideas. According to Hesselbein *et al* (2002), innovation is defined as change that creates a new dimension of performance. Rogers (1995), in his study defined innovation as getting ideas adopted. One of the basic elements of innovation is idea generation, which is arguably the first stage of the technology process. Below is a technology framework (Figure 1) that elaborates our understanding of technology.

Figure 1: Technology Framework



The technology framework in figure 1, attempts to give a clearer understanding of what technology is and the process of achieving technological products and services. In figure 1, tangible products are the physical finished product like computers, TV, cars, to be mention but a few. These tangible products are made out of ideas (innovation), which is then developed upon to create a product (invention). These invented products could only be class as technology if they are accepted or/and commercialized. The process of idea generation to invention could be class as knowledge process, because knowledge is generated in this process. Intangible products like services of a design consultant in a construction organisation could be classed as technology if accepted and commercialized. These are the skills, knowledge, and techniques the consultants develop through knowledge process. The commercialization or/and acceptance of

knowledge process leads to technological product and service through a technology process. Table 2 shows some of the different descriptions of technology transfer and the authors.

Table 2: Descriptions of Technology Transfer

Descriptions	Authors
Cross industrial transfer	Gee, S. (1981)
Cross country transfer	Darakhshami, S. (1983) & Fransman, M. (1986)
Internal & external company transfer	Kayak, E. (1985) & Stewart, C.T, & Nihei, Y. (1987)
Individual (R&D centre) and Company's Transfer	Larsen et al (1986),

The framework figure 2 attempts to give an overview of the technology transfer process.

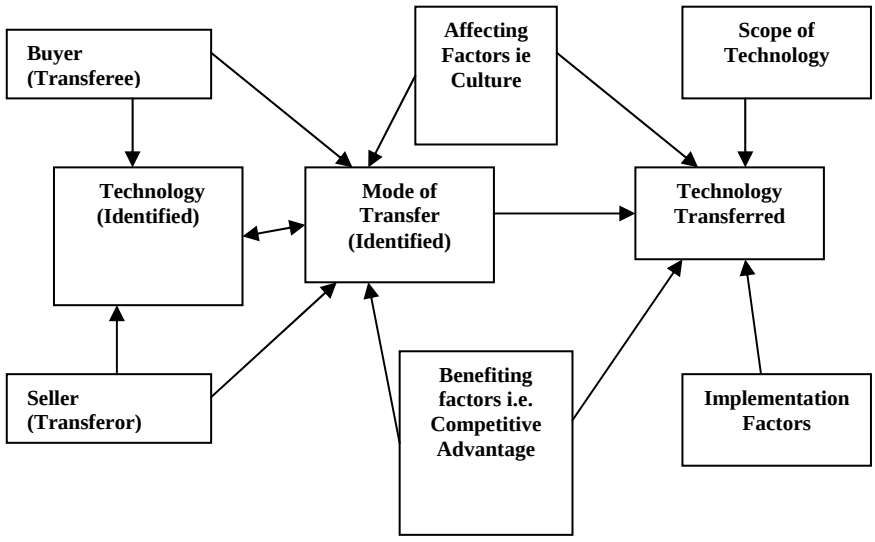


Figure 2: Technology Transfer Process

Since technology is a process (Murphy, 1967), from innovation to the actual production of technological products or services, the transfer of technology is also a process. Technology transfer process starts from the identification of technology to be transferred. What actually transfer are skills, techniques & knowledge. These are identified by the transferee (buyers) and transferor (sellers) and the mode in which these technologies could be transferred. Affecting factors such as; culture, environment, distance, people attitude, and the benefiting factors such as; economic growth and competitive advantage, have to be considered when choosing the mode of transfer of technology. For example, if the mode of transfer of technology is through licensing of the technology, the transferee has to consider these factors in relation to intellectual property (IP). These factors have to be considered with the following questions; does the transferee have a good cultural value or system for strong IP? If so? How would it benefit the transferee?

The scope of the technology will surely have an impact on the transferred technology. This scope has to be determined to make sure it is right and based on the capability of the transferee. The transferee has to choose the technology that is appropriate at the time of need. For example, it will be bad technology management if the construction industry in Nigeria decided to transfer nuclear technology into the industry. The implementation factors are basically the strategy of implementation. These factors have to be strictly adhered.

2.1 Nigerian Construction Organizations and related Challenges

The economy of Nigeria is well endowed with human and mineral resource. Apart from the oil and gas industry, the country has not been able to develop a complementary economic base, despite rich potentials in areas such as agriculture, construction, solid minerals, and tourism (NPA, 2007). Nigerian construction organisations have grown significantly in the last decade (Oladapo, 2007) with the inflow of foreign companies.

The challenges that confront Nigeria construction organisations are enormous. Although, Nigeria construction organisations, both in terms of practice and education of its participants, had their legacy and tradition from UK construction organisations (Oyedele and Tham, 2003). Despite this fact, Nigeria construction organisations remain back-ward in their practice. These could be because of the challenges that confront them such as the culture of keeping to time, corruption, value system, tribalism, lack of structure, nepotism, favoritism, attitude of workers, short cuts to duties, and lack of standard. The challenges that confront the Nigerian construction organization have to be looked at before choosing what technology to be transferred.

The typical Nigerian construction organisations has very low absorptive capacity added to shortage of well trained indigenous manpower required to plan, manage and execute contracts awarded to them (Agunde et al, 2007), which then calls for technology transfer. The Nigerian construction sector has not been accorded meaningful research and development (R&D) attention, despite the crucial place it occupies in the economy (Agunde et al, 2007).

2.2 Strategy for Transferring Technology – Implications for the Nigerian Construction Organizations

In devising strategy for technology transfer in Nigeria construction organisations, the following as to be considered:

1. Ability to determine the appropriateness of the transferred technology
2. Ability to assimilate and diffuse the technology efficiently throughout the organization
3. Ability to adapt, develop and improve upon the transferred technology
4. Appropriate information sharing network
5. Conductive government and organization policy
6. Up-to-date education and training
7. And, challenges of the construction organization.

Figure 3 shows the strategy of technology transfer by Li-Hua, (2006). In his study of appropriateness and effectiveness of technology transfer, he attempts to explain the importance of determining the effectiveness and the appropriateness of technology before it could be transferred. He went further to say that the choice of technology; the speed of transfer and the content of the technology are major factors to its transfer in addition to the willingness and cooperation of the transferor to transfer the given technology.

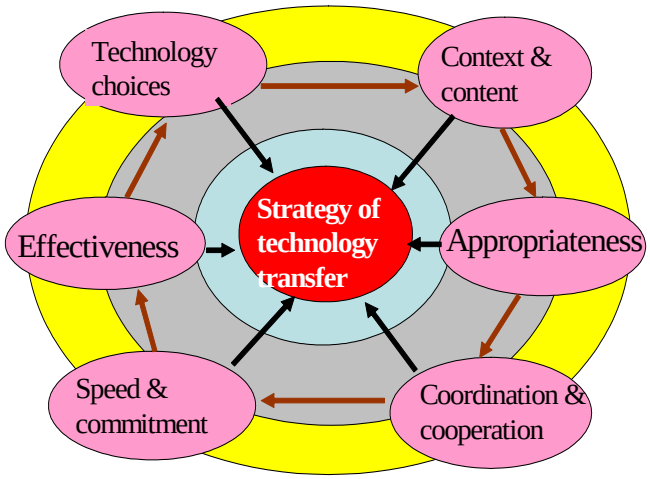


Figure 3: Strategy of Technology Transfer

(Source: Li-Hua, R. 2006)

It is not possible to understand what technology transfer strategy means without understanding the full meaning of strategy. The amount of literature available on strategy is vast and is growing at an accelerating rate. Despite the large amount of research on this subject, there is no generally accepted definition for strategy (Feurer & Chaharghi, 1997). Competitive advantage is the main aim for strategy development. Andrews (1971) defined strategy as a rational decision-making process by which an organization's resources are matched with opportunities arising from the competitive environments. The definition offered by Chandler in 1962 is an example of a holistic definition (Feurer & Chaharghi, 1997). According to Chandler (1962), strategy is defined as the determination of the basic goals and the objectives of an organization and the adoption of courses of action and the allocation of resources necessary for carrying out these goals. From Chandler's definition of strategy, and using the Nigerian construction organisations as a case study, one of the major challenges that confront the organisations is technology (RATIAS, 2001). This therefore calls for technology transfer to attempt to minimize the problems.

2.3 Technology Transfer into Nigerian Construction Organization

Poor educational system and low skilled workers (NPA, 2007) in Nigerian construction organisations have also called for technology transfer. According to the Nigerian industrial policy of 2003, the government wants to increase industrial output by providing generous incentive for technology acquisition. These the government will do

by licensing, technical assistance, consultancy and technical partnership. The Nigerian government and construction organisations recognize the importance of knowledge, skills, and intellectual property as major driving force of global wealth creation in recent time in direct relation to resource potentials. These major driving forces cannot be achieved in a short run if technology transfer is not considered. We all know that, for an economy to achieve great economic development, ample resources must be directed toward R&D and this takes time and skills, and very expensive for a developing country like Nigerian.

The Nigerian construction sector is a fast growing sector. Eighty percent (80%) of construction projects in Nigeria are in the big city and these projects are mainly done by foreign companies (RATIAS, 2001). Technology linkage is not a common thing in big companies, according to Okejiri (2000) Linkage of technology is more common in the small and medium companies in Nigeria. Although, the Nigerian government recognizes the importance of technology transfer, their focus has always been on the manufacturing, agriculture and petroleum sector. Because of the lack of government policy directed to construction sector development through technology transfer, the Nigerian construction sector has severely suffered from this.

3 Research Methodology

This paper comprises a literature review outlining the current issues of technology transfer strategy and the Nigerian construction organisations. Technology transfer strategy by Li-Hua (2006) was adopted into the context of Nigerian construction organisations.

This is an on going Ph.D research project to develop technology transfer strategy and model of technology transfer for the Nigerian construction organisation. To achieve reliability and validity of research, case studies will be used (Golafshani, 2003) for this research. These could also be achieved by contents analysis of the following documents in Nigeria; national building code, national housing policy, national construction policy, national urban development policy and national building maintenance policy. Other relevant books, newspapers articles, conference proceedings and journals will be used to measure and describe the social reality of technology transfer in Nigerian construction organisations. Observations and interviews research techniques will also play a major part in the refinement and validation of the technology transfer model.

4 Findings and Discussion

Looking at the factors that affect strategy of technology transfer in the Nigerian construction organisations, these factors need to be addressed by researchers in order to develop an appropriate strategy. Factors like government policy, attitude of workers, environmental factors, and types of technology to be transferred, have to be addressed for effective technology transfer. It also raises issues for the epistemologies and ontologies standpoints for conducting research in this complex area. Due cognizance needs to be given to different contexts, people, absorptive capacities of people in organization, and educational and training of peoples to mention but a few.

Summarily, there are interdependent factors at stake, such as political, social and economical factors, which researchers need to bear in mind.

5 Conclusion and Further Research

Technology transfer strategy is an important area of technology management in any construction organization. Nigerian construction organisations do not have a well structured technology management strategy. Developing a strategy of technology transfer will be a welcome development for Nigerian construction organisations. This paper recognizes that technology is skill, technique, and knowledge. And if these could be identified, the transfer of technology could arguably be easier.

For effective technology transfer strategy to be developed, Nigerian construction organisations should be able to identify their mode of transfer, affecting factors, benefiting factors, the scope of technology and its implementation factors. Other factors to be considered when developing technology transfer strategy include: appropriateness of technology, assimilation & diffusion of technology, communication network, government & company policies, education & training and the challenges of the organization. All these need to be considered for appropriate technology transfer strategy.

Further research could be carried out to elaborate the characteristics of skills, techniques and knowledge, and how these could be identified when transferring technology.

6 Acknowledgement

This is an ongoing PhD research project to develop technology transfer strategy and model for Nigerian construction organisations.

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Exploring the use of protégé in representing knowledge on sustainable building technologies

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Abstract:
The representation of knowledge about sustainable building technologies is of prime importance to construction professionals and software agents. Ontology creation is the key to realising this as it permits the inspection, integration, filtration, manipulation and presentation of information from different sources. Furthermore, ontologies can be used as a generic knowledge structure in the capturing and modelling of domain knowledge. Based on these strengths, we present in this paper a sustainable building technology ontology created using protégé-OWL. The rationale for choosing the sustainable building technology as a domain of interest is two-fold. Firstly, in response to the UK government's pressure to integrate sustainable building technologies in construction projects, many construction professionals are now seeking better ways of acquiring knowledge about sustainable building technologies. Secondly, construction professionals are overwhelmed with the huge amount of information being generated by the domain of sustainable building technologies. There is therefore a need to implement an efficient knowledge engineering technology in capturing and representing knowledge about the domain of sustainable building technologies. This will enable construction professionals to make informed decisions based on the knowledge represented. The paper describes the sustainable building technology ontology, the underlying design decisions and the challenges faced during the design process. The validation of the ontology was undertaken through the use of an inference engine and the results of the validation process are presented. After validating the ontology, a demonstration of how to perform inferences about the various components of sustainable building technology was undertaken and results presented.

Keywords:
Construction professionals, knowledge representation, ontology, protégé-OWL, sustainable building technology

1 Introduction

The UK housing sector is currently under pressure from the government to increase the supply of housing and improve its quality of housing as a response to the current

climate change challenges and sustainability demands (Bandfill & Peacock, 2007; Boardman, 2007). One of the ways many housing developers have been responding to this challenge has been through the integration of emerging technologies such as sustainable building technologies (SBT) into housing projects. Contrary to the usual lack of information with most emerging technologies, SBT is generating huge amounts of information requiring robust knowledge modelling techniques for easy use by different project partners (Hall, 2006). The approach adopted in this paper is that of developing an ontology that can better capture knowledge about the domain of SBT. An ontology about the domain of SBT or its components can be used for developing semantic web applications. The semantic web is a new form of web content that is meaningful to computers will unleash a revolution of new possibilities (Tim *et al*, 2001). Furthermore, the Semantic Web can considerably improve the information sharing process by overcoming the problems of current web technologies. Thus the SBT semantic web repository can serve as a repository for use in decision making by housing developers. This can contribute greatly in facilitating the integration of SBT into housing projects.

However, due to the huge nature of the domain of SBT this paper focuses on photovoltaic (PV) system technology only as it provides a representative problem domain to demonstrate the use of ontology-related concepts. The ontology presented in this paper aims to capture knowledge and reason about various concepts, concept taxonomies and relationships, properties that describe facts in the PV-ontology. The reasoning process over this ontology has been facilitated by the use of FaCT++ and the Description Logic (DL) query plug-in. The reasoner FaCT++ is used in validating the ontology (see section 5) while the DL query plug-in is used in querying the ontology (see sections 7).

The next section presents an overview of the most widely used ontology editor protégé-OWL and highlights the rationale for using it. This is followed by a presentation of the PV ontology in section 3. Section 4 highlights the design considerations implemented in the development of this ontology. Section 5 presents the challenges encountered in the development process of PV-ontology and how these challenges were overcome. Section 6 shows how the ontology was validated through the use of the reasoner FaCT++. Two illustrations of how facts can be obtained from the ontology through the use of DL query are presented in section 7. The last section of the paper summarises the paper by identifying key points.

2 Overview of protégé and its application to the development of PV ontology

The growing interest in the semantic web has stimulated an exponential growth in the development of ontology editors based on different ontology development paradigms. To choose an ontology editor with the aim of optimal exploitation of its components the purpose of the ontology has to be well formulated. Based on the purpose of the PV ontology initially reviewed in Abanda & Tah (2007) and on the review of various ontology editors available (Corcho *et al*, 2003), protégé Web Ontology Language (protégé-OWL for short) was chosen for this study. The OWL Web Ontology Language (a W3C recommendation) is designed for use by applications that need to process the

content of information instead of just presenting information to humans (W3C, 2004). Furthermore, the availability of user-friendly plug-ins with a scalable architecture in protégé-OWL is an added advantage. Three of the user-friendly plug-ins (OWLviz, FaCT++ and DL query plug-ins) have been used in sections 3, 6 & 7). OWLviz enables the class hierarchies in an OWL ontology to be viewed and incrementally navigated, allowing for comparison of the manually constructed class hierarchy referred to as *asserted* class hierarchy and the automatically computed class hierarchy referred to as *inferred* class hierarchy (see figure 1). FaCT++ provides reasoning support for DL that underpins OWL (Horridge *et al*, 2006). Currently, FaCT++ supports two types of DL reasoning, consistency checking and classification or subsumption. This check is undertaken over the ontology class hierarchy (Figure 2) while instance checking is undertaken during the ontology development process. The DL query plug-in provides a powerful and easy-to-use feature for searching a classified ontology. The DL query plug-in can be used in collecting all information about a particular class, property or individual in an ontology. Section 7 demonstrates the use of the DL query plug-in in listing the type of PV systems supplied by a given company (Figure 3a) and also selecting a range of PV systems with PV array sizes within a given range (Figure 3b).

3 Overview of SBT ontology

This section describes the main concepts of the PV-ontology and also presents a graphical representation in Figure 1. This ontology consists of a hierarchy of *PV system technology* concept, the *household energy appliance* concept, the *organisation* concept and the *unit* concept. A brief description of the various properties, i.e. annotation properties used in enriching information (meta-data), object properties to relate individuals to individuals, data type properties to link individuals to data values and restrictions has been undertaken and presented.

3.1 Concept hierarchy

The **Photovoltaic system technology ontology** consists of two main ontologies. Firstly, the *PV system* which has two main sub-concepts representing two major types of PV technologies differing in their mode of connection to the building, i.e. the *non-grid connected system* and the *grid connected system*. Secondly, the *photovoltaic system component* captures knowledge about the various physical components of the PV technology. These are *the battery, generator, inverter, system controller, battery controller, charge controller, PV array* and *gridline components*.

The **house-hold energy appliance concept** captures knowledge about the various domestic energy appliances in the UK houses. It has four main sub-classes, the *cold, wet, brown* and *cooking* energy appliances. This classification has been adopted from Firth *et al* (2008) and Market Transformation Programme (2008) which are the most current and elaborate studies on domestic energy appliances in the UK housing sector. The *cold* category is a group of appliances that are continuously switched on and power consumption cycles between zero and a set power level. The *brown* category is a group of appliances that are actively switched on by householders. When these appliances are not in use the power consumption may be non-zero. The c*ooking* category is a group of appliances that are actively switched on by householders. When they are not in use, the

power consumption is zero. Furthermore *cooking* category comprises electrical cooking equipment only. The wet category is similar to the *cooking* category but does not include electrical cooking equipment. Some examples of instances of the class *cold* are refrigerators and freezers; *brown* are mobile phone chargers and television; *wet* are tumble dryers and dish washers; *cooking* are boiling kettles and electrical ovens.

The unit concept captures the units of various physical quantities in PV technologies. Some subclasses are *EnergyUnit, MassUnit, MoneyUnit,* and *AreaUnit.* The **organisation concept** captures knowledge about the various organisations with interest in the domain of SBT and PV technologies in particular. The three sub-concepts represented here are the *installers,* the *suppliers* and *research organisations*.

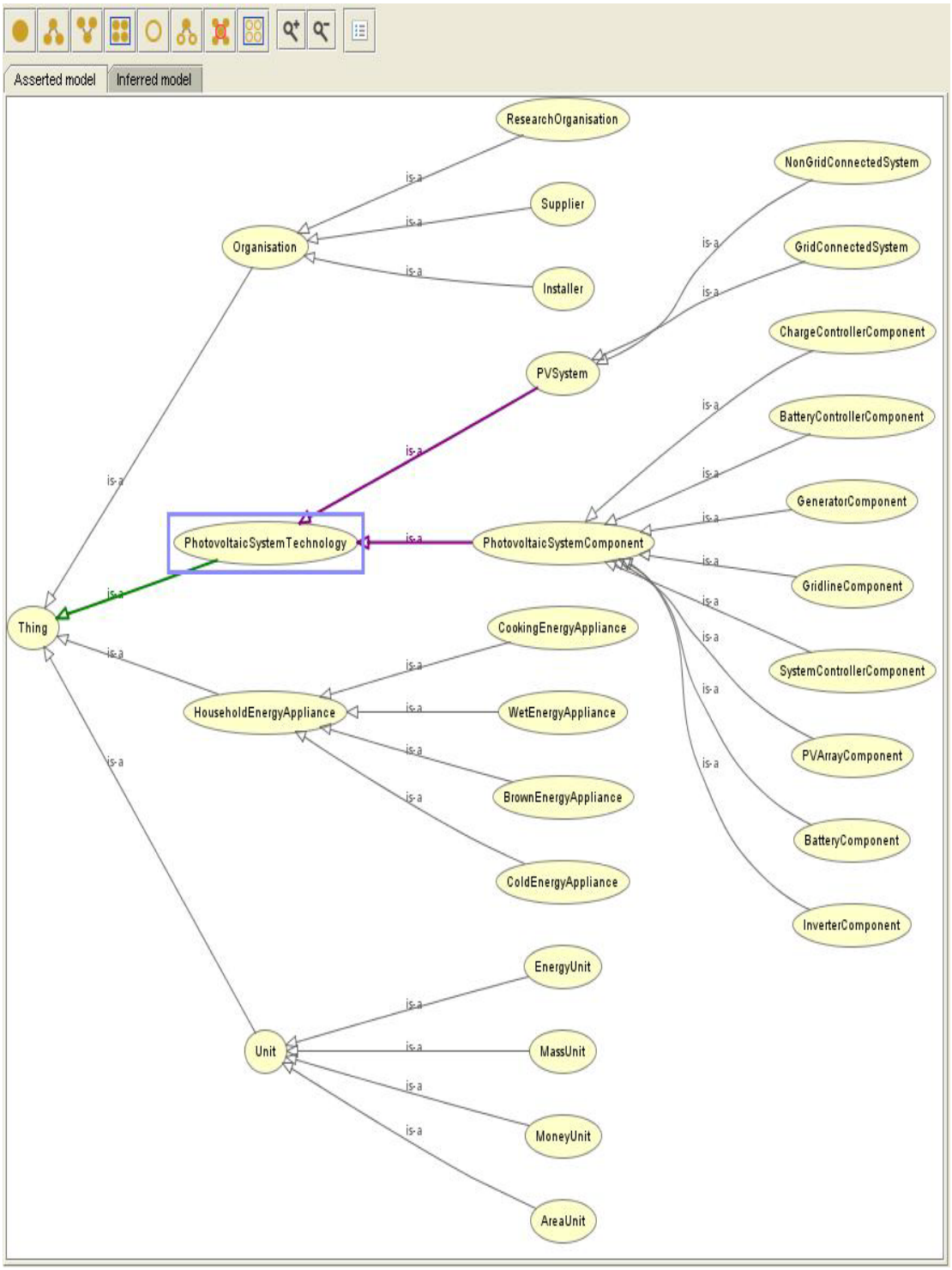

Figure 1: Graphical representation of top concepts in PV ontology using OWLviz

3.2 Properties

In ontology modelling, properties are very important as they describe the relations between concepts and consequently between instances of the concepts. The three types

of properties commonly used in ontology modelling have been used in the development of the PV ontology. These are object, data and annotation type properties

The object properties in the PV ontology are *hasComponent, hasSupplier, installsProduct, researchesOn* and *isGridConnectedTo.* The *hasComponent* property relates the set of individuals belonging to the domain of PV system to the set of individuals belonging to the domain of PV system component. The property *hasSupplier* defines the organisations supplying PV technologies in the UK. The property *installsProduct* defines the companies involved in the installation of PV technologies in the UK. The property *researchesOn* defines all the institutions in the UK that research on the domain of PV technology. The property *isGridConnectedTo* defines the PV technologies that are grid-connected.

The main data properties of the PV ontology are *hasAddress, hasArea, hasModuleEfficiency, hasWeight,* and *isMadeOf.* The *hasAddress* property defines the address of various organisations with interest in PV technology. The *hasArea, hasModuleEfficiency, hasWeight* properties define the dimensions, efficiencies and weight of various PV array modules available in the UK market. The *isMadeOf* property describes the type of PV array material i.e. mono or polycrystalline silicon.

For clarity of the PV ontology, the annotation type properties have been used in adding various pieces of information/meta-data to some components of the PV ontology in the protégé editor.

4 Design considerations

4.1 Choice of language, inference engine, and ontology editor

In the literature, there exist different ontology development methodologies (Corcho *et al,* 2003). The challenge lies in the choice of a methodology and hence tools used in building the ontology. Furthermore in making any choice based on the above available methodologies and tools, an ontology engineer is often guided by the prime purpose of the ontology. The PV ontology is intended to serve as a knowledge-base where intelligent searches about the various PV technologies, their properties, suppliers, installers and those researching on SBT can be undertaken. In designing such a knowledge-base a balance must be established between simpler and complex knowledge modelling facilities and the amount of information in the domain of discourse (Sure *et al.,* 2005). Like in most complex information systems, the knowledge modelling tools used have been carefully chosen to cope with the size of the PV ontology so as to maximise the reasoning capability. The OWL, the inference engine FaCT++ and the ontology editor protégé have been chosen to serve the above purpose. The OWL ontology language is available in three dialects supporting varying levels of expressional capability (Lacy, 2005). These are: OWL-Lite, OWL-DL and OWL Full. OWL-DL was chosen because of its richer expressive power than OWL-Lite, and facilitates automatic reasoning than OWL-Full (Lacy, 2005). Similarly FaCT++ built on Description Logic greatly facilitates automatic reasoning in ontologies. One main advantage of protégé-OWL is its ability to facilitate the browsing and editing of OWL ontologies and the fact that it has a powerful reasoner FaCT++ and DL query plug-in which provides reasoning support for the Description Logic that underpins OWL.

4.2 Representation of entities as objects, properties or data values

A common phenomenon that is often experienced in data modelling is to model entities as first class objects or dependent on some other objects (Sure *et al.*, 2005). This scenario is similar in modelling entities in ontology engineering. In the case of the PV ontology, it was fortunate as most of the concepts in the PV technology could be straight forwardly used in the PV ontology. This ease was due to the high independence of the physical component of the PV system. E.g. the inverter, battery and the generator are not related in any way except being only components of a PV. By maintaining this independence, the physical attributes of the components could be modelled as data properties and its values to data values. E.g. "efficiency" as a physical property could be straight forwardly modified to hasEfficiency as a data property and its value attributed. Though, this approach was great because of its simplicity, it was however not generalisable and hindered the refinement of the ontology. Furethermore, it was very difficult to establish relations between many concepts in the ontology . We introduced some explicit concepts and attributes wherever possible to facilitate the understanding of the semantics of the PV ontology.

5 Challenges

Two main challenges were encountered in the design of the PV ontology. The emerging and the huge nature of the domain of SBT pose the problem of reasoning efficiency and scalability in knowledge engineering. This was resolved by restricting the domain of discourse to PV systems thus minimising the amount of information to be dealt with.

Another challenge that was encountered was the representation of the units of data type properties. The latest ontology editor, Protégé 4 does not offer an obvious way of representing units of data type properties. For instance it is not obvious to represent the fact "PVArray *hasArea* 1.2 m^2" with the units of m^2 included. This was overcome by creating the *Unit* ontology and exploiting the annotation properties in describing more knowledge about the data type properties and the units.

6 Validation of PV ontology

The methodology in creating ontologies has been widely researched in the ontology community. Based on the review of these methodologies in Abanda & Tah(2008) a widely used methodology developed Noy & McGuinness(2001) was adopted for the development of the PV ontology. A major recommendation by most methodologies is the validation of any ontology against subsumption, equivalence, instantiation and consistencies (Antonio and van Harmelen, 2004). Furthermore it is only after validating an ontology that efficient reasoning could be undertaken. Currently, there exist two major methods of validating ontology (Kumanayaka and Ranasinghe, 2007),i.e. manually and automatically. Automatic validation is achieved through the use of DL reasoners. We therefore adopt the latter method of validating ontology as protégé 4 comes with two DL reasoners, Pellet 1.5 and FaCT++. FaCT++ was used in this paper.

In protégé 4, the task of validating the PV ontology was achieved through the use of FaCT++. In protégé 4 the manually constructed taxonomy is called *asserted hierarchy* while the computer hierarchy is called the *inferred hierarchy*. Evidence of automatic computation of an ontology using FaCT++ is revealed through the appearance of "Nothing" in the colour red in the inferred hierarchy pane of protégé 4(Horridge *et al*, 2007). Figure 2 below shows the asserted hierarchy and the inferred hierarchy before and after automatic computation by FaCT++. There is no difference between the taxonomy in the asserted and inferred hierarchy except the appearance of the word "Nothing". The FaCT++ operates internally based on Description Logic reasoning to produce the results in Figure 2.

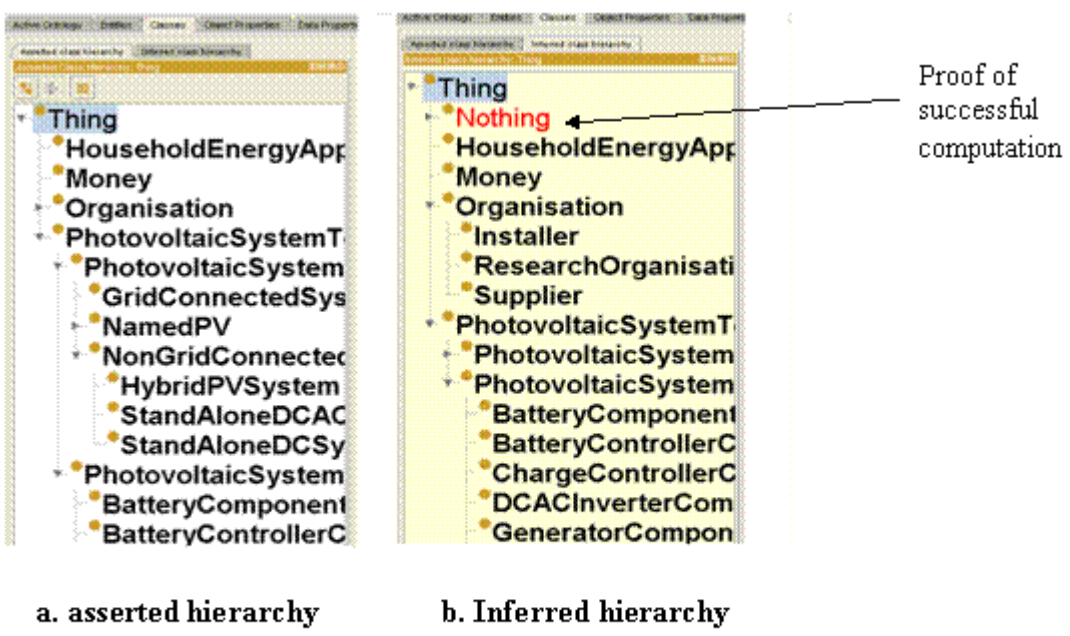

Figure 2: PV ontology validation using FaCT++

7 Reasoning with the PV ontology

A major reason for developing an ontology is to represent knowledge about a specific domain so as to enhance the reasoning and acquisition of knowledge from the domain. Amongst the many ontology languages that are used in knowledge representation, OWL is the most prominent in the ontology research community. Like most ontology languages OWL makes it possible to describe concepts in a domain, but it further provides new facilities that can enhance reasoning. It has a rich set of operators such as intersection, union, negation and property restrictions. Using these operators complex concepts can be built from very simple ones. The union, intersection, negation operators and property restrictions form the foundation of the DL and have been used in many logic applications. This section demonstrates the use of DL query in interrogating the PV ontology. In Figure 3a, a knowledge engineer may be interested in knowing the types of PV systems supplied by the company Solar_ Century. This is achievable by

writing and executing a query in the DL query pane using the DL query language syntax (Horridge & Patel-Schneider, 2008). Figure 3b is a query illustrating the selection of some PV modules based on their sizes. This is achieved by using the DL query syntax. The query “isSuppliedBy value Solar_Century” lists all the PV products produced by Solar_Century. The query “has Area some double [>1.2]” lists all PV products with area greater than 1.2 m^2. The achievement of these two results are principally due to the facts that inferencing in ontologies relies on inferred facts which cannot be expressed in conventional databases.

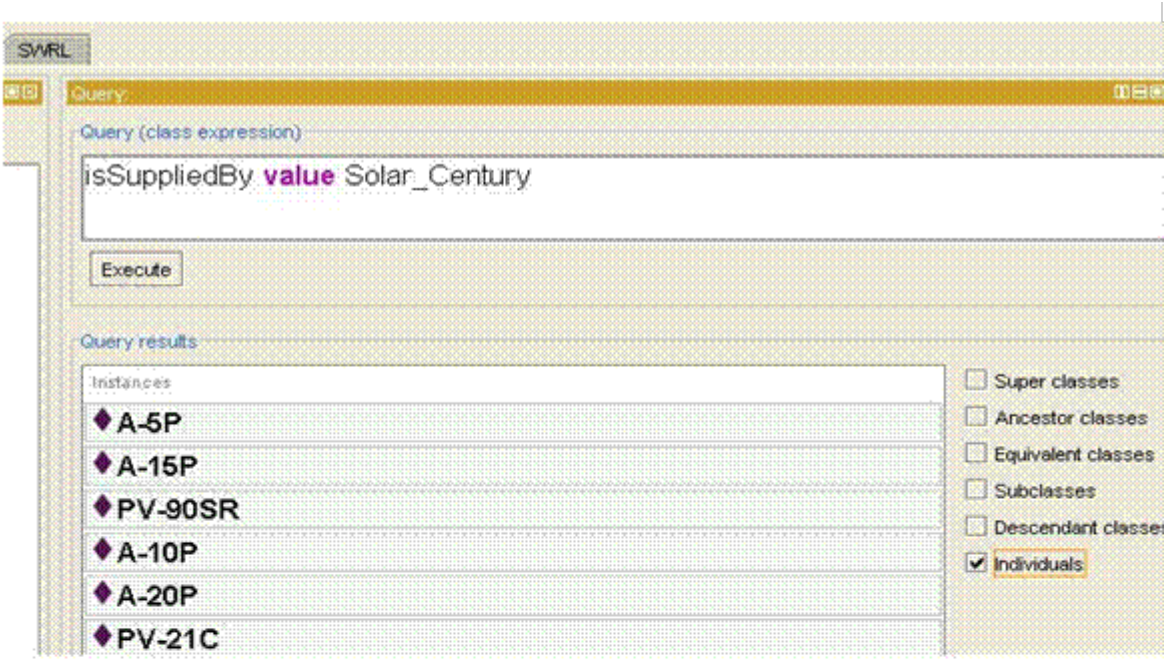

Figure 3a: Use DL query plug-in listing PV types of Solar

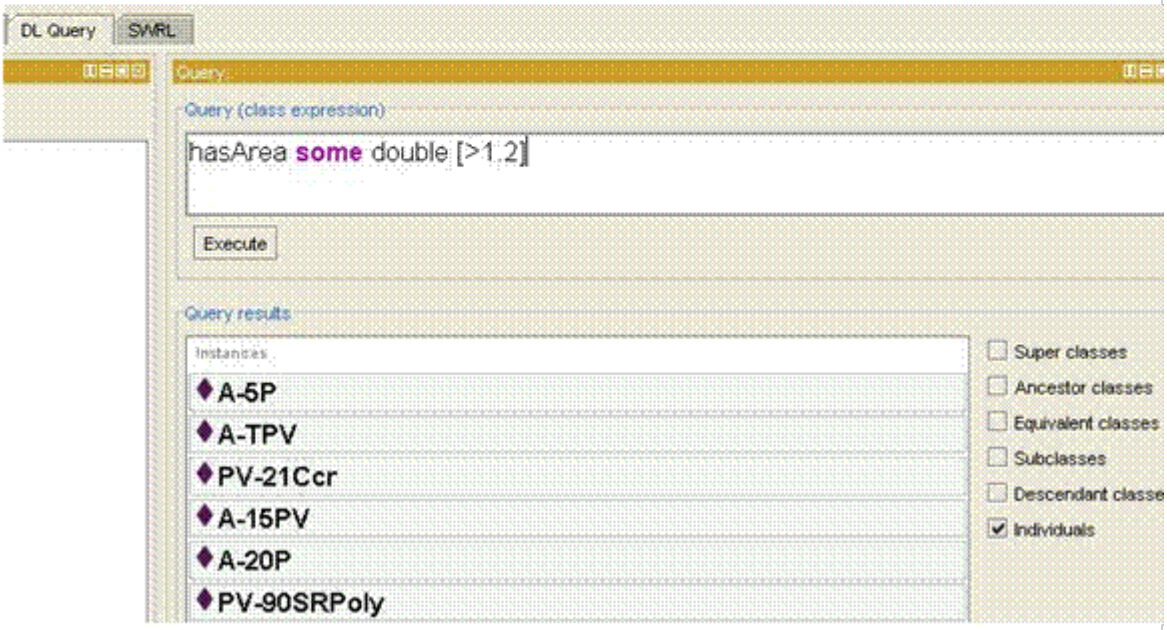

Figure 3b: Use DL query plug-in listing PV types of with a given area

8 Conclusion

In the spirit of the semantic web, the use of ontologies is a promising approach in capturing information semantics about a specified domain for use by agents interested in the domain. The agents can further develop applications from available ontologies for alternative uses. Furthermore, developing ontologies greatly enhances inferencing

which is a powerful feature needed to support the Semantic Web vision. In this light, the PV ontology has been designed to address the challenges currently facing housing developers i.e. the need to acquire knowledge about PV technologies and to integrate these technologies into their housing projects. The way-out to these challenges lies in the semantic web (with ontology as the back-bone) as it is currently the best technology that can greatly improve information sharing among end-users. Consequently we have focused on the ontology aspect in this paper and developing a semantic web application will be considered in future studies. We have therefore described the PV ontology developed in protégé-OWL, the design considerations and the challenges faced in its development and how the challenges were overcome. The ontology was validated and successfully queried using Description Logic. Further work is being undertaken to enrich the ontology with deeper semantics and rules to facilitate decision making in practice.

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Review of ICT Implementation in Education in Developing Countries: A Libya Case

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Abstract:
The use of Information and Communication Technology (ICT) in education and the role of ICT in the development of societies have been investegated in so many studies. Literature studies have emphasised the importance of ICT in reforming standards of education in developing countries. The studies also indicated that developing countries including Libya are facing economic, cultural and social problems. Therefore these countries are looking to adopt certain programs that will help them to use ICT technolgy in education system. This paper reviews ICT use in education with a paricular consideration to libyan education. This includes ICT requirements, roles and benefits of ICT, planning for ICT integration into schools, and Libya's ICT reform in education.

Keywords: *Basic Education, ICT, Libya.*

1 Introduction

Pelgrum and Anderson (1999) outlined that ICT is an important tool for soico-ecomic development and a vital component in school education. ICT which includes radio, television and digital technologies such as computers and the Internet have been touted as potentially powerful enabling tools for educational change and reform. Different ICTs, as Victoria (2002) states can help expanding access to education and strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life. The purpose of this paper is to provide a better understanding of the issues related to the implementation of ICT in education in developing countries in general and lay down a theoretical foundation for the future Libya case study.

2 Literature Review

2.1 Definition of ICT

The term ICT evolved from Information Technology (IT) when the processing of information with electronic technology integrated with telecommunications technology. Since then, the evolution has brought about unprecedented and unmatched speed with which information is created, acquired, stored and disseminated. ICT has also proliferated available media for information storage thereby resulting in enviable gains which were not deemed possible before its advent (Asika, 1991).

Pelgrum and Law (2003) explained that near the end of the eighties, the term 'computers' was replaced by IT signifying a shift of focus from computing technology to the capacity to store and retrieve information. Furthermore, the term 'ICT' was introduced to the general public, when e-mail started to become available in around 1992 (Pelgrum, 2003). By definition, ICT includes electronic networks - embodying complex hardware and software - linked by a vast array of technical protocols. ICT is embedded in networks and services that affect the local and global accumulation and flows of public and private knowledge. According to the United Nations Economic Commission for Africa, ICT covers Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities; quite a broad definition (Adeya, 2001:7).

The term ICT also refers to networks, computers, other data processing and transmitting equipment and software (European Commission, 2004). Adeya (2002) outlines that ICT is an 'electronic means of capturing, processing, storing and disseminating information'. Akuezuilo and Akudolu (2006) stated that, ICT refers to all facilities systems and techniques used by human beings to store, process, communicate and deliver information. For the purpose of this paper, the term ICT refers to the hardware, software, data network services and supporting infrastructure to manage and deliver information using computers and the Internet.

2.2 ICT in Education

The issue of demand in computer education has become more popular in educational policy-making in the early 1980s, when relatively cheap microcomputers became available for the consumer market. Moreover, there were high expectations that it would make education more effective and motivating to the early introduction of microcomputers in education in the 1980s (Pelgrum and Law, 2003). Hepp et al (2004), claim that ICT has been utilised in education since their inception, but they have not always been massively presented. Although at that time computers have not been fully integrated in the learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in ICT (Pelgrum and Law, 2003). Moreover, Kozma and Anderson (2002) wrote that education is at the core of the knowledge economy and learning society and that correspondingly, the role of ICT in schools is shifting dramatically. Similarly, Kozma and Wagner (2003) contend that the promise of information and communications technologies to enhance the basic education is a tremendously challenging area of development work today, in both poor and wealthy nations. Ezer (2005) claimed that much of the descriptive literature related to the

implementation of ICT to pedagogical ends and much is case study based while other research related to the problem domain involves curriculum studies. It is clear from the literatures that education has a central influence on the idea of ICT and therefore it must be examined and re-examined this influence in order to gain a better understanding of the role and benefits of ICT in education.

2.3 Roles and Benefits of ICT in Education

Jhurree (2005) confirmed that the impact of technology, especially computers, in education has been widely reported and discussed. Hepp et al (2004) commented that literature contains many unsubstantiated claims about the revolutionary potential of ICT in improving the quality of education. They also noted that some claims are now deferred to a near future when hardware will be presumably more affordable and software will become, at last, an effective learning tool. However, considerable resources have been invested to justify the place of technology in education, and many research studies have revealed the benefits and gains that can be achieved by students, teachers and administrators (Jhurree., 2005). Hepp et al (2004) summarised the following reasons for the application of ICT in education:

- A new society requires new skills: Due to the fact that ICT is the preeminent tools for information processing, new generations need to become competent in their use, should acquire the necessary skills, and therefore must have access to computers and networks during their school life.

- Productivity enhancement: Schools are knowledge-handling institutions; therefore, ICT should be fundamental management tools on all levels of an educational system, from classrooms to ministries.

- A quest for quality learning: Schools should profoundly revise present teaching practices and resources to create more effective learning environments and improve life-long learning skills and habits in their students.

In order to address the questions of “How can ICT be applied to support education change?” and “How can its application in education in turn support sustained economic development and social transformation?” Kozma (2005) suggested the following four types of approaches in general:

- ICT is used to improve the delivery of and access to education. This approach can improve education on the margin by increasing the efficiency by which instruction is distributed, but it need not involve fundamental change.

- ICT is the focus of learning. By learning ICT skills, students become better prepared for work that increasingly involves the use of ICT.

- ICT can be used to improve student understanding, increase the quality of education, and thereby increase the impact of education on the economy.

- Knowledge creation, technology, technological innovativeness, and knowledge sharing can contribute to the transformation of the education system and to sustained economic growth and social development.

Moreover, Papert (1997) identified the following positive effects on of ICT in students' education. These include:

- Enhanced motivation and creativity when confronted by the new learning environments,
- A greater disposition to research and problem-solving focused on real social situations,
- More comprehensive assimilation of knowledge in the interdisciplinary ICT environment,
- Systematic encouragement of collaborative work between individuals and groups,
- Ability to generate knowledge, capacity to cope with rapidly changing, complex, and uncertain environments,
- New skills and abilities fostered through technological literacy.

Kozma and Anderson (2002) claimed that ICT is transforming schools and classrooms by bringing in new curricula based on real world problems, providing scaffolds and tools to enhance learning, giving students and teachers more opportunities for feedback and reflection, and building local and global communities that include students, teachers, parents, practicing scientists, and other interested parties. Similarly, Hepp et al (2004) state that the roles ICT play in the educational system can be pedagogical, cultural, social, professional and administrative:

- Pedagogical Tool Role: ICT provides a new framework that can foster a revision and an improvement of teaching and learning practices such as collaborative, project-based and self-paced learning.
- Cultural, Social, and Professional Roles: The cultural, social and professional roles of ICT are exercised primarily through an effective use of the vast amount of information sources and services available today via Internet and
- CD-based content for the entire educational community: students, teachers, administrators and parents.
- Administrative Roles: ICT has important roles to play in making school administration less burdensome and more effectively integrated to the official information flow about students, curricula, teachers, budgets and activities through the educational system information pipelines.

As Kozma and Wagner (2003) claimed, ICT can affect the pace at which the learning gap is bridged in developing countries, both domestically and in relation to other nations. The great challenge is to harness the advantages of those technologies, in order to improve the delivery and quality of educational services, as well as to accelerate the rate at which knowledge is distributed and learning chances and outcomes are equalised throughout society (Wagner and Kozma, 2003).

Based on previous discussion it can be summarised that ICT plays substantial role in many ways. These include the improvement of student/teacher relationships and better preparation for students for perspective work. Moreover, ICT has positive and substantial impact on educational process in different aspects such as pedagogical, culture, social professional and administrative. Finally, ICT supports sustained socio-economic development and the helps in knowledge generation.

2.4 Planning for ICT Integration into Classrooms

In the recent decades education systems in many countries have witnessed major reforms of their structure and functions, and one of its tents has been the introduction and integration of ICT in the education system. The successful integration of ICT into the classroom warrants careful planning and depends largely on how well policy makers understand and appreciate the dynamics of such integration (Jhuree, 2005). Integration of ICT in education has been a contentious and debatable issue. Jhurree (2005) pointed out that some analysts argue that technology will change the educational landscape forever and in ways that will engender a dramatic increase in the performance of learners (Jhuree, 2005). Unlike these extreme advocates, there are others who adopt a balanced approach (Jhurree, 2005). They are convinced that ICT, if properly integrated, has the potential to enhance the teaching and learning process (Hepp et al, 2004; Kozma and Wagner, 2003; Commission of the European Communities, 2001; UNESCO, 2003; Pelgrum and Law, 2003).

Hepp et al (2004) note that in order to have long lasting effects, an ICT policy should preferably not be designed in isolation. Rather, it should be part of a more comprehensive effort towards improving the equity and quality of an educational system. Similarly, Levine (1998) emphasises the importance of having a plan that is based on real school needs and one that is realistic, achievable, and effective. Furthermore, Levin (1998) emphases that the plan should be produced, not for the sole purpose of putting technology in the classroom but to reflect the real needs of schools in order to make effective technology deployment and to produce enhanced learning environments. However, Hepp et al (2004) point out that there is no universal truth when it comes to applying ICT in education, and that there is no advice that can be directly applied without considering each country's reality, priorities and long-term budgetary prospects and commitment.

2.5 ICT in Developing Countries

The idea that ICT can help developing countries is intriguing to many, because of the benefits that have apparently been realized in the developed countries. As Avgerou (1990, p.12) noted 'the literature sometimes contains a naive taken-for-granted assumption that the success of the West is attributable to ICT, and therefore bringing the benefits of this development to poorer countries is simply a matter of delivering ICT.' Motivated by the prospect of greater economic, social, educational and technological gains, both developing and developed countries, are bringing about education reform, with a clear focus on ICT integration in education (Jhurree, 2005). Although ICT is now at the centre of education reform efforts, not all countries are currently able to benefit from the developments and advances that technology can offer. There are significant barriers that often referred to as "the Digital Divide" limit the ability of some countries to take advantage of technological developments. Thus, developing countries are faced with challenges related to access, pedagogy or

assessment when using ICT to improve and reform education (Kozma and Anderson, 2002).

Due to the fact that much research in the area of technology integration in education has been conducted in technologically advanced countries, but little in the developing countries, few statistics are available from developing countries (Jhurree, 2005). According to Jhurree (2005), this might imply that the former countries now possess a wealth of knowledge, skills, expertise, and the competitive edge that most of the latter countries do not possess. On the other hand, as Jhurree (2005) suggests, the latter countries can gain a lot from the expertise of their advanced counterparts. In developing countries, ICT should be combined with more traditional technologies, such as print and broadcast radio, to achieve better effectiveness (Pelgrum and Law, 2003).

Consequently, developing countries might not require investing as much as their more developed counterparts have had to do (Jhurree, 2005). According to a study undertaken by Kozma and Anderson (2002), both developed and developing countries are beginning to use their investment in ICT to reform education. Moreover, Hepp et al (2004) claim that developing countries have become anxious about the widening gap between their reality and the aggressive ICT policies of some developed countries. Consequently, there is a more urgent need to improve the quality and equity of education to bridge the gap between developed and developing nations, and ICTs are perceived as necessary tools for this purpose (Hepp et al, 2004).

2.6 Libya's education reform

2.6.1 Libya's Profile

Libya, one of the largest countries by area in Africa, is situated in North Africa, with long borders on the Mediterranean Sea where the majority of the population lives. The vast portion of the country covered by the Sahara Desert is hardly inhabited (Hamdy, 2007). The following table provides some selected socio-economic indicators for the country.

Table 1: Socio-economic Indicators: Libya (Source: Hamdy, 2007)

Indicator	Total
Religions	Sunni Muslim 97%; other 3%
Languages	Arabic, Italian, English. All are widely understood in the major cities.
Population	5.9 million (includes 166,510 non-nationals) (2006 est.)
Religions	Sunni Muslim 97%; other 3%
Languages	Arabic, Italian, English. All are widely understood in the major cities.

2.6.2 The Libyan Education System

According to Hamdy (2007) education in Libya is free from elementary school right up to university at home or abroad. Schools are positioned throughout the country. The

policy is to reach out even to the nomadic hard-to-reach areas, and mobile classrooms were introduced to cover all of Libya. The first nine years of education are compulsory and are known as basic education, which consists of six years of primary school and three preparatory schooling. In addition there is thee of secondary education. Hamdy (2007) further, explained that Higher education in Libya is provided by universities (both general and specialised) and higher technical and vocational institutions.

2.6.3 ICT Policies

The national policy for ICT in education was launched in 2005 and is mainly managed by the Ministry of Education and other different Ministries. The policy in general aims at enabling access to the ICT through the provision of computers and the Internet. This is planned for the short term and there are some signs that the policy is being followed up and implemented (Hamdy, 2007). However, the main aim is to improve the quality of education through ICT by:

- Adopting modern techniques and methods in education.
- Encouraging the scientific community to engage in research within the community.
- Encouraging the private sector to get involved in funding higher and specialist education.
- Developing open and distance learning as well as continued education.
- Encouraging higher education.

Libyan Authorities have recently given more consideration to the importance of ICT in education and as a result steps are now been taken to establish the required infrastructure to introduce and implement ICT in different levels of education. However, the outcome of this new policy is still in its earlier stages.

According to the literature review and the initial study, the following factors have identified which will potential affect the effective adoption and implementation of ICT for education in Libya. These factors will form the basis of the future research.

- Inadequate ICT infrastructure including computer hardware and software, and bandwidth/access;
- A lack of skilled manpower, to manage available systems and inadequate training facilities for ICT education;
- Resistance to change from traditional pedagogical methods to more innovative, technology-based teaching and learning methods, by both students and academics;
- The over-dependence of educational institutions on government for everything has limited institutions' ability to partner with the private sector or seek alternative funding sources for ICT educational initiatives.
- Lack of effective co-ordination of all the various ICTs for education initiatives;

- Learning from all these and other success stories: Libya must emphasize education and information and communication technologies in order to be able to develop its economy.

3 Research Methodology

Due to limited previous studies that have been carried out covering this topic within Libyan context, the nature of this study is exploratory and descriptive in nature. Exploratory studies are particularly useful " when we do not know much about the situation at hand, or when we have no information on how similar problems or research issues have been solved in the past" (Sekaran, 2000).

The main research method adopted so far was literature review. The literature review provides a general background in the study (Sekaran, 2000). Therefore, in this study, the literature review is aimed to provide a general background on the role of ICT in education, particularly within the developing countries as well as on the development and current status of the Libyan education. It also assisted the developing a general theoretical framework for the study.

4 Conclusion and Further Research

This paper reviewed various ICT definitions and the importance of ICT in the developing countries. The role and benefits of ICT in education have been also been investigated. Libya is currently developing an ambitious plan to make full use of ICT in education by connecting a large number of communities and organisations through a modern network. The paper provides a theoretical foundation for further stages of the study.

This paper is a part of an on-going PhD research entitled "Factors Affecting the Adoption and Implementation of Information and Communication Technologies (ICTs) in the Libyan Basic Education (LBE)", which will intend to help policymakers in developing countries particularly in Libya to define a framework for the appropriate and effective use of ICT in their educational systems. It also addresses the issues in the use of ICT in education—effectiveness, cost, equity, and sustainability. The research will also discuss of key challenges that policymakers in developing countries must reckon with when making decisions about the integration of ICT in education, namely, educational policy and planning, infrastructure, capacity building, language and content, and financing.

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Barriers to Industrialized Building System (IBS): The Case of Malaysia

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Abstract:
The benefits of Industrialised Building System (IBS) as a modern method of construction are numerous and far reaching. Reduced construction time, better site management, reduced wastage are but a few of these benefits, that will ultimately produce better products for the customers. The Malaysian government has spared no effort to bring IBS to the drawing tables of all professionals involved in the built environment. The IBS Roadmap 2003 -2010 has been endorsed by the Cabinet of Ministers to be the blueprint document for the industrialisation of the Malaysian construction sector. Nevertheless, towards the last two years of the roadmap period, the effort to promote the usage of IBS as an alternative to conventional and labour intensive construction method has yet to make headway. Although members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change, insufficient information and lack of technology transfer methods to support feasibility of change to IBS. Thus, the paper reviews literatures conserving barriers on implementing IBS in Malaysia which requires attention from different parties. Then, the paper validates the barriers identified in the literatures through pilot study with the practitioners from the industry. The barriers highlighted from both literatures and pilot study are negative perception, readiness issues, cost and equipment, poor planning and regulations, poor knowledge and awareness issues. Finally, the paper proposes recommendations to improve IBS take up in Malaysia. IBS in Malaysia may requires serious marketing and re-branding efforts, restructuring in R&D focus, reorganizing training and awareness program and proper incentive for IT adoption.

Keywords:
Barriers, Implementation, Industrialised Building System (IBS), Malaysia, Recommendations

1 Introduction

Industrialised Building System (IBS) is not new to the construction industry. Only it has now reemerged worldwide into the 21st century as a plausible solution to improve

construction image and performance. The method will enable cost saving and quality improvement through the reduction of labour intensity and construction standardisation. Apart from this, it offers minimal wastage, less site materials, cleaner and neater environment, controlled quality, and lower total construction costs. Successful IBS implementations in the world are Sekisui Home (Japan), Living Solution (United Kingdom), Open House (Sweden) and Wenswonen (Netherlands) (Oostra & Joonson, 2007). The Malaysian government has spared no effort to bring IBS to the drawing tables of all professionals involved in the built environment. The IBS Roadmap 2003 - 2010 has been endorsed by the Cabinet of Ministers to be the blueprint document for the industrialisation of the Malaysian construction sector (IBS Roadmap, 2003). Nevertheless, towards the last two years of the roadmap period, the effort to promote the usage of IBS as an alternative to conventional and labour intensive construction method has yet to make headway. This research intends to discuss the underlying barriers of IBS implementation in Malaysia which require attention from different parties. This will eventually add to the body of knowledge and provides fresh updates to previous studies and reports by Hamid et al (2008), Hussein (2007), IBS Steering Committee (2006), IBS Roadmap Mid-Term Review (2007), Rahman & Omar (2006) and Thanoon et al (2003).

2 The Problem Statement

Early survey in 2003 reported in IBS Roadmap 2003-2010 (2003) and IBS Survey (2003) indicate that only 15% of overall construction projects in Malaysia used IBS. However recent study in 2006 published in IBS Roadmap Review shows that the percentages of completed projects using more than 70 % of IBS components in the construction project are in the range of 10%. Additionally, less than one – third of total construction projects using at least one IBS product in the year (IBS Roadmap Review, 2007). This percentage is lower than expected despite a huge publicity campaign from the government. The actual projection for percentage of completed projects using IBS is in the range of 50 % in 2006 and 70% in year 2008 (IBS Roadmap, 2003). Despite well-documented benefits, the take-up so far, while reasonable, is not as high as the government anticipated at this stage. Relatively, the low labour cost in Malaysia is the root cause of the problem (IBS Roadmap Review, 2007). Although the members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change and insufficient information to support feasibility of change (Hamid et al, 2008). Thus, the problem of limited IBS take-up in Malaysia has triggered this paper to identify the barriers and seek ways forward.

3 Research Methodology

This paper is a preliminary study to a PhD research on Industrialised Building System (IBS). This paper has been divided into three parts. The first part investigates literatures conserving the barriers of IBS implementation in Malaysia. The second part is reporting the result on pilot study to validate barriers in IBS implementation and the final part is recommendations and conclusion derives from evidence commencing both the literature reviews and the pilot study. First, the paper use literature review to investigate existing evidences conserving the barriers of IBS implementation in Malaysia. The literature

review defined as a systematic survey and interpretation of research findings in particular topic (Vogt, 1999). The aim of a literature review is to have a good grasp of the main published work concerning a particular topic or question in your field establishing the context of the topic or problem (Hart, 1998). It will group authors who draw similar conclusions and highlight gaps in research (Caulley, 1992). The sources of information are from well known refereed journals, journal with original articles, books, conference proceedings and reports. Then, the paper applies unstructured interview and open discussion (qualitative) with construction practitioners to validate the barriers which first identified in the literatures. The qualitative method in pilot study permits informal setting that natural reflects the reality of what happen or 'phenomenon' in the real setting (Rudestam et al, 1992). This approach also allows the researcher and the participants to probe each argument in details and obtain rich and more complex data in term of tacit knowledge, perception and human experience in which can not be measured in quantitative approach which are the ability to understand people's meaning as identified by Easterby-Smith et al (2002). The authors imposed a careful selection process of the participants; compulsory high degree of knowledge and direct practice in the area of IBS to construct some validity and robustness of the method. The authors also appointed an experience moderator (second supervisor of the PhD research) to monitor, lead the discussion and ensured that the participants are aware of the aim, objectives and methodology of the study.

4 IBS Definition

To date there has been no one commonly-accepted or agreed definition on Industrialised Building System (IBS). However, there are a few definitions by researchers who studied into this area previously emphasizing on the concept on pre-fabrication, off-site production, manufacturing and mass production of building components (Rahman & Omar, 2006; Lessing *et al.* 2005; Thanoon *et al*, 2003 and Warszawski, 1999). The paper selects workable definition of IBS which is a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works (IBS Roadmap, 2003).

5 The Current State of IBS in Malaysia

IBS in Malaysia has begun in early 1960's when Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program (Thanoon *et. al.*, 2003). After their successful visit in 1964, the government had started first project on IBS which aim to speed up the delivery time and built affordable and quality houses. About 22.7 acres of land along Jalan Pekeliling, Kuala Lumpur was dedicated to the project comprising seven blocks of 17 stories flat there are 3000 units of low-cost flat and 40 shops lot. This project was awarded to Gammon & Larsen Nielsen using Danish System of large panel of pre-fabricated system (IBS Survey, 2003). Today, the use of IBS as a method of construction in Malaysia is evolving. Many private companies in Malaysia have teamed up with foreign expert to offer IBS solution to their project (IBS Survey, 2003). The current IBS systems used in Malaysia housing projects are large panel systems, metal form systems and modular system. The IBS system is largely used in Shah Alam, Wangsa Maju and Pandan

housing development area (Swee in Sarja, 1998). Pre-cast panel, steel frame and other IBS solutions were used as hybrid construction method to build national landmarks such as Bukit Jalil Sport Complex, Kuala Lumpur Convention Centre, Lightweight Railway Train (LRT) and Petronas Twin Towers. Nevertheless, the government of Malaysia feels that the usage of IBS is still low despite potential advantages and strong promotion. From the survey conducted by CIDB of Malaysia in 2003, the usage level of IBS in local construction industry stands at only 15% (IBS Survey, 2003). On the other hand, the total registered IBS contractors in Malaysia stand for 895 companies in year 2007. Registered IBS manufacturer in Malaysia until 2007 is 138 producing 347 IBS products which are available in the market. The endorsement of IBS Roadmap 2003-2010 in Malaysia by the Malaysian Parliament on 29th October 2003 expressed the urgency of IBS implementation in Malaysia. It is a blueprint of total industrialisation of construction industry towards achieving total industrialised industry and promoting open system by the year 2010. The roadmap is a comprehensive document that divided the IBS programme into the five main focus areas that reflect the inputs needed to drive the programme (Manpower, Materials, Management, Monetary, and Marketing) (IBS Roadmap, 2003). Recently, the new circular from the government dated on 31st October 2008 has emphasized on the full utilization of IBS for all government's projects in Malaysia. The used of IBS components in government projects must not be less than 70% per project.

6 The Barriers to IBS Implementation in Malaysia

Evidently, the need for adopting IBS in Malaysia construction industry is immense due to strong encouragement from the government and well documented benefits. Nonetheless, a number of barriers were identified as being potential hurdles to the implementation:

6.1 Readiness

IBS is yet to get a good respond due to the construction readiness (Hamid *et al.* 2008). Superior construction technology like IBS and extensive use of IT requires highly skilled workforce to replace foreign workers. Currently, local workforce is reluctant to join the industry because of the issues of low wages combined with low emphasis on occupational safety and health. The current training program to produce new construction workforce is still not be able to cater vast demand of the market. As such, regardless of foreign worker policy, foreign labour to do manual job is still heavily needed by the industry and it is available abundant in cheaper cost (Construction Industry Master Plan, 2007). Moreover, specialized skills such as system integrator or assemblers need intensive training and apprenticeship which require more time and investment (Thanoon *et al.* 2003) (IBS Steering Committee, 2006) (Rahman & Omar, 2006). In implementation stages, contractors as assemblers and system implementers in Malaysia are lack of past experience in IBS and their professional was not trained in this area (Hamid *et al.* 2008). Hamid *et al.* (2008) also observed readiness issues in strategic area; lack of R&D, low IT adoption and limited technology availability have generally discourage IBS take up. Moreover, local manufactures of building components are not ready to produce continuity of supply of components. It appears that most innovative system and components or using innovative materials are based on imported

technologies are obviously more expensive and difficult to purchase by local contractor (IBS Roadmap Review, 2007) which contributed to the limited take up.

6.2 Cost Issues

A lot of designers and contractors are reluctant to adopt IBS system and prefer to continue using the conventional method of construction. This is due to the fact that they are already familiar with the conventional system and for them the technology suit well with small scale projects and therefore not willing to switch to mechanized based system. Furthermore small contractors lack financial backup and are not able to set up their own manufacturing plants as it involves very intensive capital investment. In this case, financial issues become the main obstacle for small contractors to move forward with the IBS system (Rahman & Omar, 2006). In the perspective of components' manufacture, IBS construction requires high initial investment capital for pre-casters to purchase new machinery, mould, importing foreign technology and wages of skilled workers for installation process (IBS Steering Committee, 2006) (Thanoon et al. 2003). IBS is also unattractive choice to developer due to wide swing of housing demand, high interest rate and unsure economic condition (Thanoon et al. 2003). As a result, the industry viewed IBS as threats to their business and not as opportunities (IBS Roadmap Review, 2007). It appears that existing procurement and contracting system is also not in the 'favorable' format to both pre-caster and contractor to use IBS.

6.3 Awareness and Knowledge

According to IBS Roadmap Review (2007) report, the adoption of IBS in Malaysia is a client driven. Clients with a good knowledge and awareness of IBS benefit will certainly encourage designers to design IBS. However, lack of awareness program to understand client and to spread correct information has contribute to a lack of interest from the clients and decision makers to embrace in IBS (Rahman & Omar, 2006). As a result, IBS is often misinterpreted by the stakeholders as high risk and not contributing to any benefits to the practitioners. Lack of knowledge among the designers contributes to the project delays because of to the extra time taken to produce detail drawings. On the other hand, poor knowledge among the approving authorities has resulting the misunderstanding and misinterpreting on IBS and the relation to the current building regulations. Familiarity with IBS will expedite design approval and it is vital to ensure successful IBS project (Construction Industry Master Plan, 2007). The majority of the approval authorities nonetheless is not aware of IBS design and often takes more time than usual to process design approval. It is also observed by Chung & Kadir (2007) recently that most of local authorities in Malaysia are unlikely to change local building regulation to suit IBS as the amendment will consume more time and cost. According to IBS Mid Term Review (2007), the enforcement of Modular Coordination (MC) trough the amendment of Uniform Building by Low (UBBL) is yet to be implemented due to poor knowledge and awareness on IBS and Modular Coordination (MC) concept among the reviewers and policy makers.

6.4 Planning and Implementation

At presents, the pre-casters and contracting firms in Malaysia are involved after tender stage of the construction value chain. However, the paper observed that, IBS design needs to be addressed and plan form the design stage to be successful adopted trough design integration and coordination of pre-caster, designer and contracting firm (IBS Roadmap Review, 2007). As a result to current practice, a lot of IBS project in Malaysia is not cost effective as IBS normally proposed to be an alternative design to traditional method. IBS application has to be incorporated during the design stage. The changing in design from traditional to IBS requires a lot of further adjustment will rise the initial time and cost. In implementation stages, IBS requires coherent structure of process planning and control from start to end of the project in order to reach the goals and reduce defect and errors (Gibb, 2001) (Warszawski, 1999). The overall project should be planned in such way that as soon as the components are manufactured, it is possible to transport it to the construction site and assemble it. Any delays either on manufacturing floor or construction site has severe impact on staging requirement and production planning where components from several construction projects are scheduled for production at the same time. Although it is possible to pre-fabricate any kind of building design, but if the possibility of manufactured construction is taken into account at design stage itself, several issues relating to manufacturing, transportation, complex interfaces and final assembly can be resolved (Pan *et al*. 2008) (Hamid *et al.* 2008).

6.5 Negative Perception

Rahman & Omar (2006) observed that the term IBS is often misinterpreted with negative image due to its past failures and bad architecture in the past. IBS is associated with pre-fabricated, mass construction method, low quality buildings, leakages, abandoned projects, unpleasant architectural appearances and other drawbacks. Due to the poor architectural design in the past, the pre-fabricated buildings have given the public, bad impression about pre-cast concrete. This image is so powerful and clients are often in doubt of using IBS because of fear of customer rejection. Construction professionals are reluctant to use IBS due the potential post-construction problem. On the other hand, designers found pre-fabrication has limiting their creativity in design process (Hamid *et al.* 2008). It is observed that lack of IBS branding and promotion taking place in the market as the end user are neither misinterpret nor unaware of this construction method. As a result, IBS is not creating enough pull factors from the users itself to encourage developers to adopt IBS. In comparison, IBS development in Scandinavian and Japan is promoted as customer focus solution through mass-customization. In UK, IBS is well associate with sustainability and green construction. Better customer perception will create better understanding, creating new demand and will definitely encourage developers to push for IBS adoption

7 Pilot study to Identify IBS Barriers in Malaysia

Pilot study aim is to validate and cross-reference the barriers to IBS implementation with the practitioner's perspectives and point of view. Thus, the study was conducted with industry representatives using unstructured interview approach and open ended discussion. This pilot study is organized in conjunction of '*Workshop on Aligning R&D Themes and Titles to the Requirement of Construction Industry*' held by Construction

Industry Development Board (CIDB) Malaysia. It involves practitioners from private companies, Public Work Department of Malaysia, government agencies, IBS consultants and representatives from construction related professionals bodies. After a lengthy deliberation, the paper concludes that the factors contributing to the delays of IBS implementation and other issues related to IBS in Malaysia are listed as follows:

- IBS is not popular among architects and design consultants
- Lack of knowledge among designers on IBS
- The need for mindset change through promotion and education
- The stakeholders face a 'chicken and egg' dilemma
- Lack of support and slow adoption from private sector
- Proprietary systems make it hard to be adopted by designers
- Poor quality products available in Malaysia
- Joints are not standardized making it hard to design as the design will have to be fixed to a particular manufacturer
- Lack of push factor for authorities and responsible government bodies by laws and regulations
- The professionals in Malaysia is lack of technical knowledge about IBS components
- Volume and economy of production in scale IBS components
- Monopoly of big boys, limiting opportunities to other contractors
- Low offsite manufacturing of construction components available in the market
- Require onsite specialized skills for assembly and erection of components
- Lack of special equipments and machinery which hampered work. Need more local R&D, support services, technologies and testing of IBS components
- Mismatch between readiness of industries with IBS targets by the government
- Lack of involvement from 'Bumiputera' contractors as an erectors or manufactures
- Insufficient capacity building for contractors to secure project in construction
- Sustainability of construction industry, government to lead during downturn.

8 Discussion

A comparison between data conserving the barriers in literatures and results from pilot study reveals the significant relation. Thus, the pilot interview validates findings which highlight negative perception, readiness issues, cost and equipment, poor planning and regulations, poor knowledge and awareness issues. For the purpose of this paper, the barriers identified in both the literatures and pilot study was classified into a fishbone diagram for further study. The purpose of the diagram is to clarify and analyses the

barriers. An overview of barriers for Malaysian construction stakeholders to embrace in IBS is depicted in **Figure 1.**

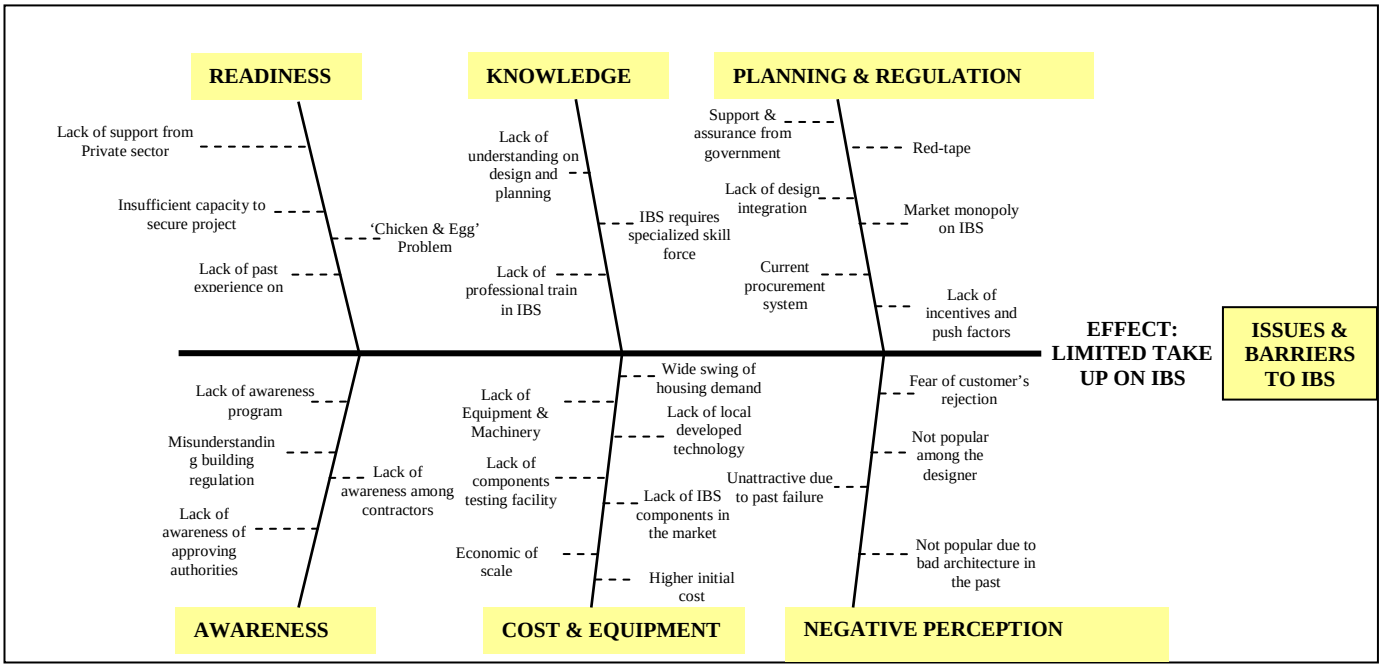

Figure 1: Fishbone Analysis on IBS Implementation Barriers: the case of Malaysia

9 Recommendation

The following are some of the recommendations proposed by the authors to increase IBS take up in Malaysia. More evidences need to establish to support the paper and validate points and suggestions which has been highlighted in this study. The recommendations are listed as follows:

Reengineering the role of contractor - IBS implementation requires contractors to be system integrator and process coordinator managing process from production line to site. The process demanded new skills and knowledge such as integration, planning, and monitoring. This is due to a huge risk of uncoordinated error and tolerance during the construction tenure of IBS project. Reengineering contractor roles from traditional practice to IBS is inevitable. The contractors need new organization set-up, strategic direction and procedure that 'favorable' to IBS. Professionals should be train in integration role between design and product production using relevant IT tools. In this case, the government agencies in Malaysia must provides relevant consultation and create special funding to encourage reengineering and change management initiative to suit IBS process. Although, IBS adoption is strongly related to clients and designers aspiration, there is not surprise if contractors can lead the role and influence overall IBS implementation in Malaysia.

Restructuring awareness programs – Comprehensive awareness programs and showcases of best practices need to be established in order for IBS to be understood and

widely used. Current awareness programs in Malaysia were ineffective and attract a lukewarm response from construction practitioners. The program only invites targeted audiences and in such way had failed to cover the vast majority of construction stakeholders. It is important for the new awareness program to run periodically and find way to educate all the stakeholders. Current activities for example seminars, workshops, discussions, focus groups should be retained in the program. In addition, mass-media communication and site tour to real production facilities or project site to showcase best practices should be encouraged. The awareness program must also support two-way communication between the promotion agencies and the stakeholders. In such way, the program is a platform to understand stakeholder's perspectives on IBS and vice versa. Buildoffsite program in the UK for example promotes awareness program to educate and understand the client perspective, needs and issues related to construction. The program becomes a platform for clients and contractors to sit together and discussing on how IBS can give benefit to both parties other than one-way promotion program. The government trough relevant agencies in Malaysia must imitate the program and put effort to encourage two way communications and best practice sharing between promoters, clients and contractors.

Restructuring IBS training program - Comprehensive preliminary study should be conducted by the government to identify skill gaps in IBS sector in order to create a comprehensive and systematic training program. The preliminary study will ensure the training fits the needs of IBS organization and accommodates current skill shortages in the market particularly on specialization skills such as design and installation based on information from real practice. In terms of design, the engineers must have competent knowledge in component analysis and IBS building design. In the construction field, the contractors and site engineers must have enough knowledge on the safe and accurate methods of erecting and assembling IBS components into a building structure. As such, training and professional development is vital to ensure successful IBS adoption in Malaysia.

Restructuring R&D focus on IBS - The inadequacy of corroborative scientific research undertaken to substantiate the benefit of IBS system as mentioned in Thanoon *et al.* (2003) require a new approach to be taken on board. A long term and strategic approach of conducting research on IBS shall be established including strong involvement of universities, companies, organizations right from the onset of any IBS R&D projects. R&D themes should not be limited on developing hard issues e.g. jointing system, IBS material but also to undertake a comprehensive study on IBS solutions encompassing the entire value chain. These include the research on developing verification progress, IBS related software, vendor developing system, marketing system, building concept, IBS safety procedure, IBS whole life cycle costing, lean construction concept and developing financial model for IBS firm. Government should increase the allocation research grant through it agencies and provide more incentive i.e. tax reduction to encourage more R&D contribution in construction industry particularly on IBS.

Improving ICT adoption - Industrialisation processes in construction method requires accurate and reliable information exchange. As compared to traditional method, Information Technology (IT) in IBS projects covers wide and extensive range of processes, for example in customer interfacing, design, production, monitoring and

integration. Extensive use of modern IT tools supports the different IBS processes by enabling more accurate documents and hence good conditions for an effective production where errors are discovered early and problems in the manufacturing and assembly phases can be avoided (Lessing *et al.* 2005). Lessing *et al* (2005), Eichert & Kazi (2007), CIDB (2003), Hervas (2007) are suggested the utilization of IT in IBS projects to support integration, provide accurate data, help customers in selection process, distribution and logistic and cost comparison. Verweij & Voorbij (2007) suggested IT roles during IBS project in term of communication with customer, communication with all actors, quality control on product and process and performance measuring and re-use of experiences. IT is also vital for IBS in market analysis tools, intelligent component catalogues, assembly planning and monitoring tools and design and configuration tools as observed by Manubuild (2008). As such, government should encourage more positive policies and incentives on IT and provide financial facilities for contractors, designers and component's manufactures to improve IT capacity and capability in construction.

Paradigm shifting on IBS through rebranding - IBS development in Scandinavian and Japan are well associated high customer focus and mass-customization. While in the UK, IBS promotes sustainability and green construction. This is the time for Malaysian construction industry to re-brand IBS construction. Current effort to brand IBS construction as cheap and fast construction solution is relatively poor strategy as it associated IBS with historical failure, poor workmanship and poor design to customers due to cost reduction mentality. The strategy now is rather to focus on customer pulls rather than technology push or cost reduction. The term IBS which carry the name of Industrialised Building System might be change to Intelligence Building Solutions which reflect more innovative and better image. In the era where customers are more educated in the issues of sustainability, carbon footprint and global warming, IBS should be branded as value for money solution with quality and environmental friendly solution. IBS designers should associate lifestyle aspects in IBS design where customers input is gathered and design is then generated based on their opinion. More showhouse must be developed to showcase the building components and highlights its feature as a holistic sustainable building of future of dwellings. This will attract not only attract new buyers and set-up new market ranges but also improves the overall image of construction industry

10 Conclusion

The paper discussed barriers underlying IBS implementation in Malaysia. IBS in Malaysia has been introduced to cope with a growing demand of affordable housing, solving issues associated with foreign workers and improving image, quality and productivity of construction related services. The usage of IBS in Malaysia has begun since early 1960's in a low cost housing scheme and today IBS has evolved and used in hybrid construction to build national landmark. Despite its plausible advantages and systematic implementation plan established trough IBS Roadmap, numbers of barriers was identified as being potential hurdles to the implementation. The barriers include negative perception, readiness issues, cost and equipment, poor planning and regulations, poor knowledge and awareness issues. The paper uses a fishbone analysis to map-up the barriers conserving IBS implementation in Malaysia. In general the

barriers have hindrance the construction practitioners in Malaysia to adopt IBS as construction method. The paper proposed recommendations to improve IBS take up and ensure successful roadmap implementation. It includes reengineering the role of contractor, paradigm shift on IBS through rebranding efforts, improving ICT adoption, restructuring R&D focus, restructuring IBS training program, restructuring awareness programs and reengineering contractor's role. With the present conventional methods of construction, the industry is always associated with many unprofessional practices. The adoption of IBS promises to elevate every level of the industry to a new height and image of professionalism. The authors observed that IBS should be branded as value for money solution with quality, whole life cycle costing and environmental friendly to change customer's perception of past failure and bad architecture which strongly associated with IBS. The term IBS in Malaysia could perhaps be changed from Industrialised Building System to Intelligence Building Solution which reflects innovativeness and better image. The awareness program must also support two-way communication between the promotion agencies and the stakeholders. In such way, the program is a platform to understand stakeholder's perspectives on IBS and vice versa. In 2008, IBS Centre has been established in Kuala Lumpur by the government to play the role as promoter of IBS in Malaysia trough activities such as consultancy, verification and certification of IBS product, training, R&D and showcasing IBS product which is excellent effort for future development of IBS. It is also important for Malaysia through the government agencies to benchmark IBS development with other countries such as Japan, Sweden and Singapore which have been successful in IBS implementation. It is hoping that the research will provide great path for further research and data collection regarding on IBS issues in Malaysia

11 Further Research and Relation to PhD study

The paper is a preliminary research to develop understanding prior conducting a regional benchmarking study between contractors in Malaysia and UK. The paper aims to have a good grasp of the main published work concerning a particular topic or question in the field establishing the context of the topic or problem. The recommendations which have been proposed in this paper will be used as criteria for benchmarking study. The objectives of benchmarking are to identify process and functionality gaps. At the end of the PhD research, the study will has to propose recommendations to improve IBS readiness in Malaysia. The benchmarking process is depicted **Figure 2**.

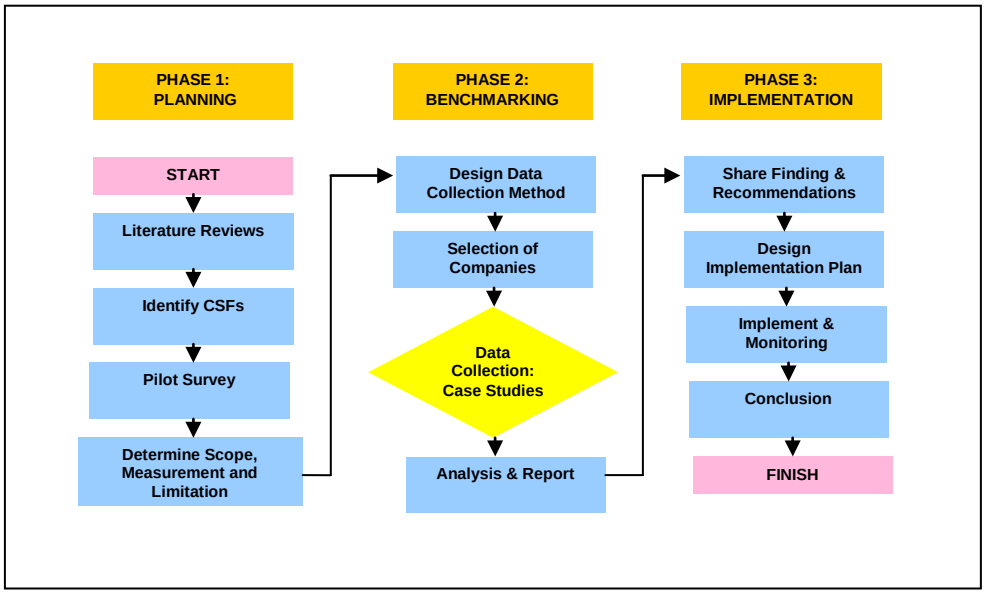

Figure 2: The Benchmarking Model

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Industrialised Building System: The Critical Success Factors

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Abstract:
Industrialized Building System (IBS) has been identified as a potential method to improve overall construction performance in term of quality, cost effectiveness, safety and health, waste reduction and productivity. Whereas the advantages are very plausible, the idealism behind the industrialised construction is far from being practical and beneficial to the majority of contractors. This scenario leaves the contractors with noticeable difficulties in implementation while remain to be competitive and profitable. The limited take up is also associated with readiness issues and lack of previous experience in IBS. Thus, the paper reviews literatures conserving Critical Success Factors (CSFs) for contractors in implementing IBS. The paper validates the CSFs using qualitative interview with the practitioners from Manubuild Consortium. In general, the CSFs highlighted from both literatures and interview session are training and education, leadership and organisation structure, cost management, supply chain and procurement, information technology, site management, change management, optimisation, design integration, capital expenditure planning and risk assessment. The CSFs derived from this paper will be used as Benchmarking criteria in a study between IBS and traditional contractors to capture best practices and improve contractor's general readiness. The result is not aim to be conclusive but rather a call for debate and obtains more feedback from the audience.

Keywords: contractor, construction, Critical Success Factors (CSFs, Industrialized Building System (IBS)

1 Introduction

Industrialized Building System (IBS) has been introduced to cope with a growing demand of affordable housing, solving issues associated with foreign labours and improving image, quality and productivity of construction industry. The limited take up on IBS have triggered many research initiatives attempting to scrutinized the barriers and seek the way forward. For contractors, the call to use IBS is less attractive due to cost and risk issues, lack of professional trained in IBS, limited IT adoption and lack of

guidance (Pan et al. 2008; Pan et al, 2007 and Blismas, 2007). The transformation process from traditional practice to IBS has left the contractors with noticeable difficulties in IBS implementation while remain to be competitive and profitable. To date, there has been little discussion about the Critical Success Factors (CSFs) of contractors which transformed from traditional contractor to IBS. Therefore, the paper tends to investigate the CSFs on the perspective of contractors involve in IBS as reported from the literatures. Then, the paper validates the CSFs trough a pilot interview with representatives from the Manubuild Consortium. Manubuild Consortium is a technical group established among key construction organisations across Europe to promote the concept of Open Building Manufacturing (OBM). Manubuild's establishment is also a wake up call for radical paradigm shift from the current 'craft resource based' construction towards 'open building manufacturing' that enable high customised building using manufacturing in open market and assembling them efficiently on site (Eichert and Kazi, 2007).

2 Research Methodology

This paper is a preliminary study to a PhD research on IBS implementation among the contractors. This paper has been divided into four parts. The first part deals reviews and analyse the current state of IBS implementation including the barriers, push and pull factors and enabling factors which affected IBS implementation. The second part investigates literatures conserving the CSFs for contractors to embrace into IBS construction. The third part is report on pilot study to validate CSFs and the final part is discussion and conclusion derives from evidence commencing both the literature reviews and the pilot study. First, the paper use literature review to investigate existing evidences conserving CSFs in IBS implementation. Then, the paper applies unstructured interview and open discussion within the pre-determined context to validate the CSFs. The qualitative method permits informal setting that natural reflects the reality of what happen in the real setting. This approach also allows the researcher and the participants to probe each argument in details and obtain rich and more complex data in term of tacit knowledge, perception and human experience in which can not be measured in quantitative approach. The authors imposed a careful selection process of the participants which has need a compulsory high degree of knowledge and direct practice in the area of IBS to construct some validity and robustness of the method. The authors also appointed an experience moderator to lead the discussion and to avoid any 'leading question' which can influence the data validity. In addition, the authors have ensured that the participants are aware of the aims, objectives and methodology of the study. Though the paper make some action to establish validity and reliability in constructivism setting, caution must be applied as the findings might not be representing the whole scenario construction industry thus more data collection need to done. Therefore, the result is inconclusive but rather a call for debate and obtains more feedback from the audience. Further data collection is required to determine exactly how CSFs effect the transformation of IBS contractors.

3 Relation of this Paper to Overall PhD Research Study

The CSFs which have been identified in this paper are the criteria in Benchmarking study in the later stage of the research. The main study involves a comparison analysis

between the conventional contractors and IBS contractors in order to identify process and functionality gaps. Multiple case studies and analysis will be conducted between the Manubuild Consortium's members and Malaysia G7 contractors. The Benchmarking process is divided into three different phases (planning, benchmarking and implementation) and 12 steps of continues stages as depicted **Figure 1**. At the end of the research, the study will has to propose recommendations to improve readiness among traditional contractors and construct a framework for the transformation process. Hence, the following discussions of this paper are dedicated to map the barriers, drivers and enabling factors, identify the CSFs and validate the result trough a pilot interview.

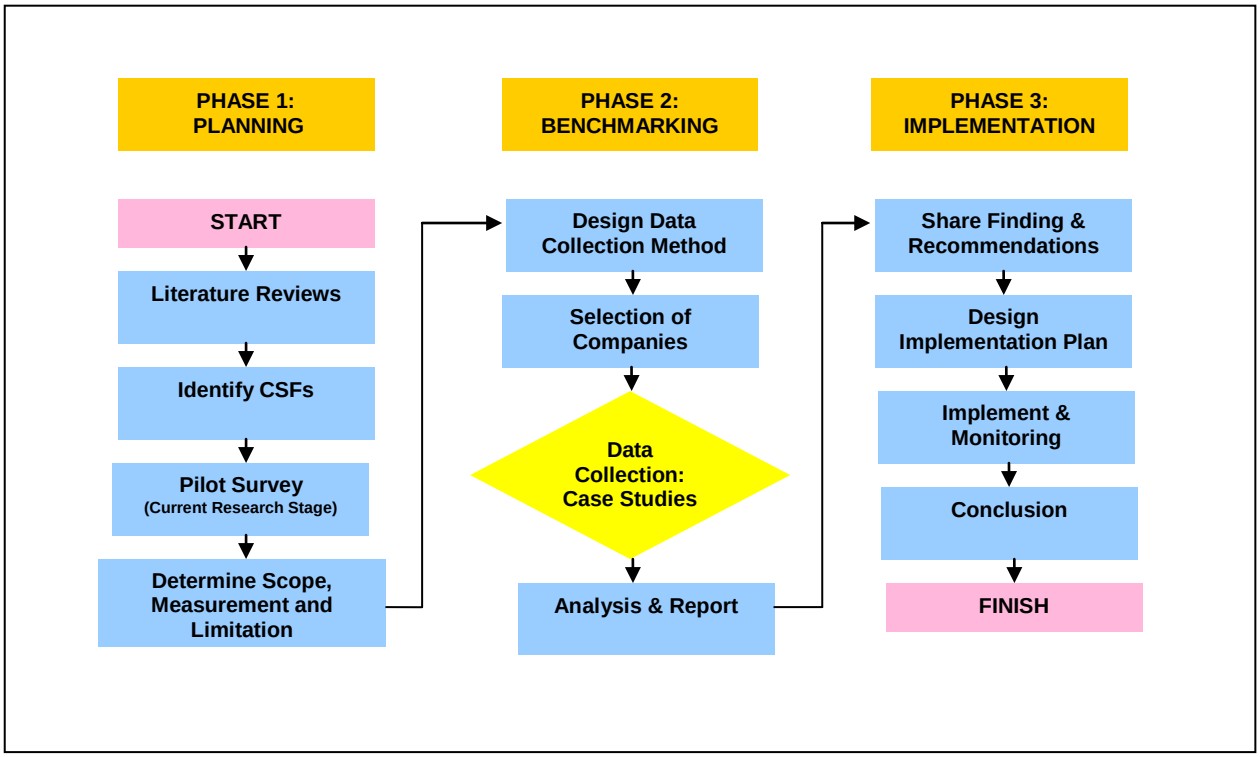

Figure 1: The Benchmarking Model

4 Scope of the Research

The contractor is the firm that is in prime contract with the owner for the construction project, either in its entirety or for some designated portion thereof. Contractor responsible to organize, plan, schedules and control the field of work and liable for getting the project completed within the time and cost limitation. Although, IBS implementation involves various parties along the supply chain for instance the manufactures, clients and designers, the paper will only focus on the contractor's perspective and aim to identify CSFs for contractors to embrace in IBS. The contractor or building contractor deals with project management activities and therefore they are responsible for installation of components (assembler) at site. The term contractor is used throughout this paper to represent building contractor or installer as a matter of simplification.

5 IBS Definition

To date there has been no one commonly-accepted or agreed definition on IBS. However, there are a few definitions by researchers who studied into this area previously emphasizing on the concept on pre-fabrication, off-site production, manufacturing and mass production of building components (Rahman & Omar, 2006; Lessing *et al.* 2005; Thanoon *et al,* 2003 and Warszawski, 1999). The paper selects definition of IBS as a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works (IBS Roadmap, 2003).

6 The Critical Success Factors (CSFs) Definition

The CSFs first appeared in the literature in the 1980s when there was interest in why some organizations seemed to be more successful than others and research was carried out to investigate the success components and also those things that must be done if a company is to be successful (Ingram et al., 2000). While a variety of definitions of the term CSFs have been suggested, this paper will use the definition first suggested by Bullen & Rockhart (1981) who saw it as the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization. They added that, CSFs is the few key areas where things must go right for the business to flourish and for the goal to be attained. The CSF approach to identifying and measuring an organization's performance was developed and became well-established under the work of Bullen & Rockhart (1981) and Rockhart & Crescenzi (1984). In the context of this paper, the CSFs is identified and will be used as criteria for a Benchmarking study as proposed by Camp (1989) and other researchers.

7 Pull and Push Factor of IBS Implementation

Several studies investigating pull and push factors in IBS implantation (Pan *et al,* 2007; Pan *et al,* 2008; Blismas *et al,* 2006; Thanoon *et al,* 2003 and Warszawski, 1999). The pull factors that encouraged the use of IBS are quality improvement, reduce defect, reduce site duration, housekeeping improvement, waste reduction, saving in the use of manual labour, incentive from government and cost saving. On the other hand, the push factors that encourage the adoption are reduce in safety & health risk, addressing skills shortage, dealing with environment and sustainability issues, client influence and government policy.

8 Barriers and Enabling Factors

Despite the plausible advantages, IBS implementation had to face shortcomings as highlighted by recent literatures and reports (Hamid *et al.* 2008; Pan *et al,* 2008; Hussein, 2007; IBS Review, 2007; Pan *et al,* 2007; Blismas *et al,* 2006 and CIMP, 2007). The barriers for the adoption are cost issues, poor knowledge, resistance from customers and professionals, misunderstand of building regulations, increase in risk, complex interfacing between systems, market monopoly, IT integration, few code and standard, lack of integration in design stage, manufacturing capability, legal and cultural

issues. Nevertheless, several enabling factors has been identified to improve the adoption mainly come from government initiatives. The enabling factors are the demand and market share (Goodier & Gibb, 2006), Research and Development (R&D) (Hamid *et al*, 2008), government promotion and incentives (Pan *et al*, 2007 and CIMP, 2007), political lever (Pan *et al*, 2008) and standard plan, apprentice on-the job training program, testing and verification program and vendor developing program (Hussein, 2007). **Figure 2** depicted an overview of IBS implementation in the perspective of contractors.

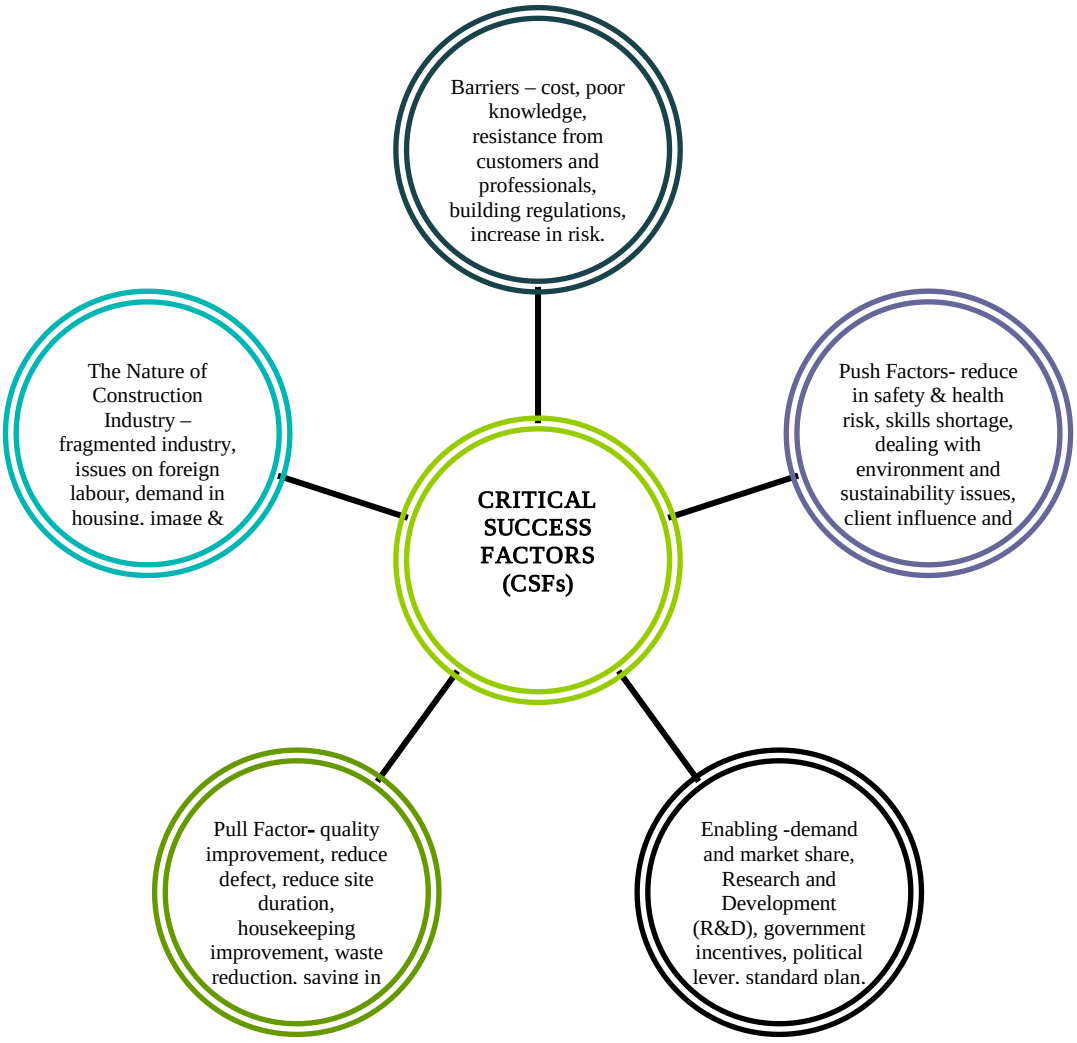

Figure 2: An overview of IBS implementation of the perspective of contractors

9 The Critical Success Factor (CSFs)

In most of construction contract both using IBS or traditional, the contractor is given an opportunity to set the price which is in tender or bidding phase. From that point, the profits are determined from the contractor's abilities trough the project management

team to save money from project sequences. As such, the only way a profit can be generated is trough better planning and the skill to make good and prudent decision. Putting this argument into perspective, the transformation from conventional to IBS required tremendous focus to several critical areas which are important to achieve a transformation goal and at the same time gain benefit and profit from it. While variety of definitions of the term CSFs have been suggested, this paper will use the definition first suggested by Bullen & Rockhart (1981) who defined it as the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization and as the few key areas where things must go right for the business to flourish and for the goal to be attained. The CSFs for contractors to embrace in IBS construction are highlighted as follows:

a) Training and Education

Historically, the construction industry had a poor record at investing into training and education (Ball, 1996). The large proportion of construction industry workforce are general labourers with narrow skill based and limited training. Although IBS is used to address the skill shortage in construction industry, some evidence suggests that a skilled workforce in specific skill areas like integration, coordination and assembly are become more important to IBS due to a different undertaken roles and project methods. Therefore, a broader and comprehensive training program must be taken on board to cater vast demand in these specialised skills (Clark, 2002; Palmer *et al*, 2003 and Goodier and Gibb, 2004). (Pan *et al*, 2008) and (Housing Forum, 2001) claim that IBS required a high level of technique and precision compared to traditional method. Evidently, the high level of specialities is derived from high level of training and professional education. By taking the above mention points and arguments, an investment in training to master IBS skills is inevitable and critical to contractors to succeed in IBS. According to Goodier and Gibb (2006), developed training program should have focus in adopting the role as system integrator at site with a full amount of responsibility in coordination and integration activities. Thus, the training equipped the workers with a clear understanding on issues related to implementation, monitoring, handling and installation of building components.

b) Leadership and Organisation Structure

A strong leadership in both institutional and management level are important in order to convince the decision makers, customers, clients and own organisational hierarchy on the lead to use innovative technology such as IBS. In strategic point of view, the leadership with high level of technical competence will ensure prudent risk taking, targeting specific target market (Bleyse and Manley, 2004) and therefore ensure the contractor firm will sustain in a competitive market of construction industry. Good leadership attribute is also important to deal with cultural issues, internal resistance towards IBS and introducing collaborative work at site and design office. Previous studies have reported that organizational rigidity is a barrier to innovation adoption in construction organisation (Nam and Tatum, 1997). An organisation structure which is more open and supportive to innovation will has more tendency to be successful in adopting new construction method and more likely to be an organisation that are favourable and supportive to IBS implementation

c) Information Technology

IT has proved to be an important key enabler in product design and much likely to be implemented in the construction industry. In manufacturing, a large scale and complex engineering projects as the development of the 'Airbus A380' aircraft are only feasible by using simultaneous and concurrent engineering interwoven with suitable 3D design toolkits (Jaeger, 2007). Similarity to an advance and more complex construction technology for instance the modular houses and mass-customisation can only be developed and produced using an extensive and interwoven IT tools. Eichert and Kazi (2007) and Hervas and Ruiz (2007) point out that IT improve tendering, planning, monitoring, distribution, logistic and cost comparison process by establishing collaborative design integration, accurate data and effective dealing with project documents. Verweij and Voorbij (2007) and Oostra and Jonson (2007) identifies the role of IT tools which are to establish communication between project team and suppliers and as a medium for quality control of overall project deliveries. The communication channel and integration enable effective 'feedback-respond' activities between design and production where errors are discovered early and problems in the manufacturing and assembly phases can be avoided (Lessing *et al.* 2005). InPro system is one of the IT tool developed to improve design integration. InPro system is an advanced system of integrated design, analysis processes and decision-support developed based on existing IT tool. The tool will radically improve collaboration and integration between design, manufacturing and assembly process (Jaeger, 2007). One of major the drawback to IT implementation is higher initial cost. Moreover, the development and implementation of the system required highly skilled personnel which eventually discouraged some contractors due to the cost issues (Abderrahim *et al.* 2008)

d) Cost Management

Evidently, cost impact is the major barrier to IBS implementation (Goodier & Gibb, 2004; Vanables *et al*, 2004 and Pan *et al*, 2007). In general, contractors are likely to maintain tight control over the budget and schedule to guarantee profit margin. Therefore, the use of IBS demands careful and detailed cost planning and management at all stages (Sanderson, 2003). Good cost comparison analysis tools are critical to support decision making in choosing IBS over the conventional method. The contractors need a framework for comparing costing solution in more holistic manners (Blismas *et al*, 2003). Pan *et al.* (2007) also draw attention to balance and transparent comparative costing framework for IBS project. Tool such as IMMPREST (Interactive Model for Measuring Preassembly and Standardisation Benefit in Construction) toolkit describing details the measurement of risks and benefits of using prefabrication (Blismas *et al*, 2003). Better cost data lead the contractor in pursuit of systematic costing and estimating tools for tendering phase.

e) Supply Chain & Procurement

Historically, the industry relationship between the main contractors and its suppliers is comparable to 'master to servant' relationship where there are lacks of togetherness and the information protectionism is widespread over the industry (Faizul, 2006). To worsen this situation, current state of supply chain in the construction industry are fragmented and underpinned by poor communication, adversely relationship and lack of trust,

commitment (Hong-Minh *et al*, 2001) and relationship between parties has been driven by the cost agenda (Wood and Ellis, 2005). The suggestion to improve procurement system and supply chain to enhance IBS adoption was proposed by Hong-Minh *et al.* (2001), Vanebles *et al.* (2004) and Goodier and Gibb (2004). One of the plausible recommendations is partnering and strategic alliance approaches to project delivery in creating a shared project vision and developing complementary objectives between project participants. In his analysis on Supply Chain Management (SCM) of IBS, Faizul (2006) identifies good supply chain characteristics consist planning and management of all activities including procurement, conversion, logistic and coordination between contractor, suppliers, intermediaries and third party solution providers within and across the company structure. Partnering with suppliers and component's manufactures from the early stages of project sequence is significant to ensure efficient and timely delivery of supply and specialised work with high quality of products. Nevertheless, partnering has not escaped criticism from observers. Although good partnering with suppliers and subcontractors is important, the competitive tendering system mean, the contractors must see price as overriding feature and frequently it mean inability to offer repeat business (Gray and Flanagan, 1989). It make contractors tend to be independent and choosing the lower tender bid to archive competitiveness.

f) Site Management & Process

In contras to the traditional method, the design, manufacture, assembly and other related processes in IBS project requires more coherent structure of process planning and control in order to reduce defects and errors (Gibb, 2001) (Warszawski, 1999). In general, the contractor was responsible to organize, plan, schedules and control the field of work and become the system integrator of whole construction process at site. Therefore, contractors equipped with systematic planning to manage complexity in transportation, logistic and interface between systems (Pan et al. 2008; Hamid *et al.* 2008 and Blissmas, 2007). One of the important aspects in planning and monitoring internal process is standardisation. Standardization as observed by Voorbij (2007) reduced project costs by process simplification, increase efficiency, simplifies communication, reduced time to align business processes and systems and improved utilisation of human resources. However, some of notable drawback to standardisation is argument that it more concern about the process or way in which the organisation goes about their work but not the end result. It contributes to a lack of focus on result orientation process and it will not encourage innovation adoption (Ranns & Ranns, 2005).

10 Pilot Interview to Validate the CSFs

This paper aims to validate and cross-reference the CSFs with the practitioner's perspectives and point of view. Thus, the pilot interview was conducted with representatives from the Manubuild Consortium using unstructured interview approach and open ended discussion to the context related to IBS. After a lengthy deliberation, the paper suggests the CSFs from the practitioner's point of view are:

- Risk assessment and risk mitigation to deal with 'trail and error' stages normally at the early phase of the transformation process

- Strategic alliances and partnering in supply chain procurement including strong connection and support from mother company in some cases
- Design integration to deal with changes in design and improve construction buildability
- Change Management and 'occupational physiologist' approach to deal with cultural issues and reluctant professional
- Measuring productivity in both off-site and on-site project sequences
- Institutional and management leadership to convince clients to use IBS
- Prudent cost management and financial with detail calculation on cost and investment projection
- Optimization on design, process and project sequences by having a detail program and understand the complex process
- The need to have specialised skills in certain areas
- Identify market prospect and capital expenditure (CAPEX) requirement
- Long tem planning and realistic time frame
- New procedure, business approach, investment planning

A comparison between data conserving CSFs in literatures and results from pilot interview reveals the significant relation. Thus, the pilot interview validates findings which highlight the importance of training and education, site management, IT, supply chain and cost management. For the purpose of this paper, the CSFs identified in both the literatures and pilot interview were classified into three categories which are process and program, people and industry. An overview of CSFs for contractor to embrace in IBS is depicted in **Figure 3.**

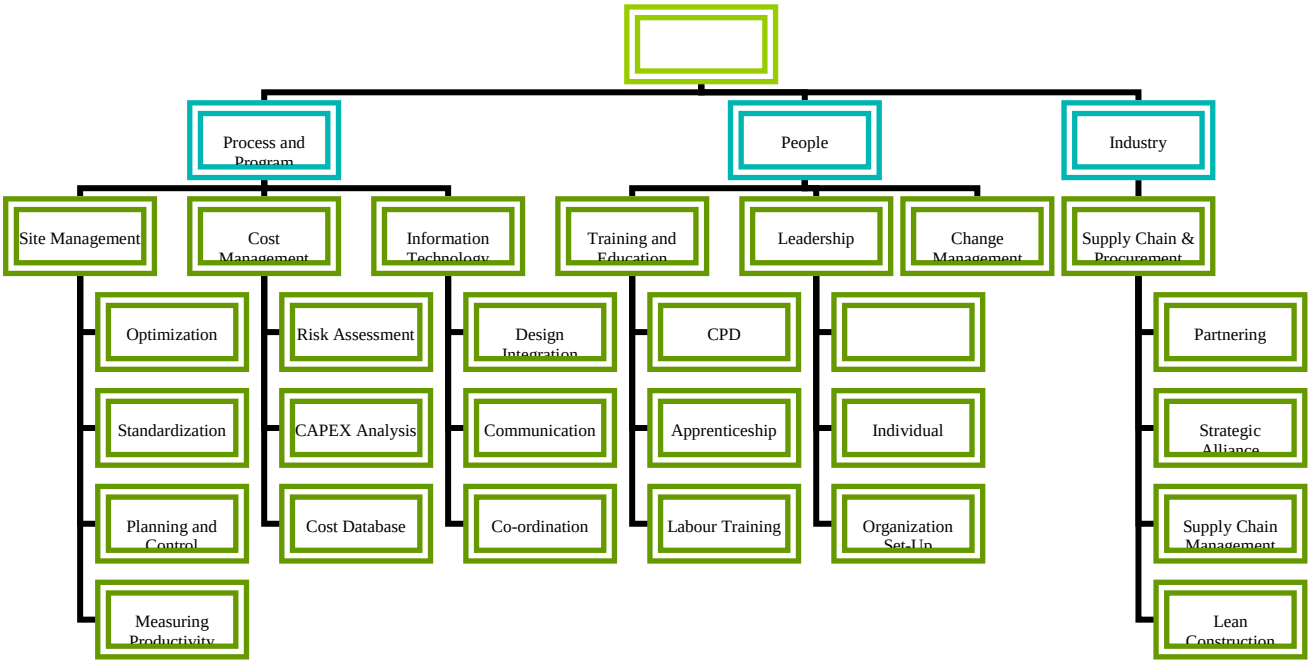

Figure 3: The Critical Success Factors (CSFs) of Contractor to Embrace in IBS

11 Discussion and Conclusion

Industrialised Building System (IBS) has been identified as a potential method to improve overall construction performance in term of quality, cost effectiveness, safety and health, productivity and waste reduction. Nevertheless, the large numbers of building contractors are reluctant to use IBS due to cost factor, lack of previous experience, increase in project risk and lack of professional trained in IBS. The paper investigates the CSFs which are limited numbers of areas that ensure successful competitive performance and IBS adoption. First, the paper depicted an overview of IBS implementation including the barriers, pull and push factors and enabling factors. Second, the paper presents the literature review conserving the CSFs of IBS implementation in perspective of contractors. The CSFs highlighted in this paper are training and education, leadership and organisation structure, cost management, supply chain and procurement, Information Technology, site management and cost management. Third, the pilot interview was conducted to validate CSFs derived from the literature reviews. In general, pilot study report reveals a significant relation between factors highlighted from the literature and the data obtained from the interview thus the paper concludes that the CSFs were accepted and validated at some point. However, with only one interview conducted in the pilot study, caution must be applied as the findings might not be representing the whole scenario construction industry. Nevertheless, the authors have taken several actions to improve validity and reliability according to methodology in constructive epistemology. The pilot interview also reveals additional factors to be considered as CSFs which are risk management, business

planning, optimisation, measuring productivity and Capital Expenditure (CAPEX) analysis. The respondents are even suggesting the appointment of 'occupational psychologist' to deal with cultural issues involving professionals. Finally, the CSFs were classified into three categories which are process and program, people and industry. Apart from identifying and validating the CSFs, the paper also concludes two things; first, the adoption of IBS required focus in both hard and soft issues. Second, contractors play different roles in IBS which is more towards assembling or system integrating role which requires careful attention to critical area both in process, people and its relation to the industry. The CSFs will assists in our understanding of the role of contractors in IBS project and therefore improve overall readiness among the traditional contractors. The CSFs derived from this paper will be used as criteria to benchmark a process gaps between IBS and traditional contractors, capture the success elements and improve general readiness among the traditional contractors.

12 Acknowledgment

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Interaction between Electronic Communication and the Other Communication Media in the Construction Projects: Case Studies from UAE Construction Projects

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Abstract:
This paper investigates the interaction between various communication media, in and around the construction project environment. It is related to a research project which studies the effect of using electronic communication management systems on the success of construction projects in United Arab Emirates. This is performed considering the strategic objectives of the whole project management processes in pursue towards attaining the project success and the benefits of the stakeholders' organisations. The research emerges from the deduced hypothesis of the anticipated co-existence of different communication media within the construction project environment, and that this should not be regarded as a failure in the electronic communication system to cover the whole information needs of the project stakeholders but it should rather be concluded as a social and efficient combination that will take place eventually. The research methodology uses both deduction and induction in order to reach to a conclusion, and will rely on data collected during case studies and action research case studies conducted on construction projects in United Arab Emirates. It is anticipated that this line of thought could yield to a better understanding of the role of electronic communication tools in the construction industry, and help developing and employing them more efficiently.

Keywords:
Communication, Electronic Communication, Construction, Project Management, Success Criteria.

1 Introduction

The use of electronic communication in the sort of web based or else at the construction projects is taking place together with the other communication media and tools. This

interaction and integration between the different communications media has been analysed as part of the analysis of case studies conducted on construction projects in United Arab Emirates.
This research is trying to foresee the strategic effects of the construction industry migrating to the internet as a media for communication, with a futuristic thinking towards the future implementation which expects this communication mode to -merge with- rather than to replace or dominate over - the other prevalent communication media including face-to- face meetings, paper based and the others. This merger will and is already reshaping the nature of the construction industry, in an analogy to how the same merge is affecting the human society in general.

This investigation was initiated when the first author encountered what he mistakenly, considered at that time as anomalies, in the electronic communication case studies, conducted on the construction projects in United Arab Emirates. The findings revealed that despite of the implementation of advanced electronic system at these projects, but a major portion or at least key "hinges" and "links" remained relying on the other construction media such as the face –to face contact and meetings, refer to figure 1 (quoted from ElSaboni, et al., 2008). At first, during the analysis of the case study, these findings have been interpreted as an anomaly or failure in the communication system, this failure reduces the efficiency of the implementation and this interpretation has been in line with many of the world wide literature about the subject (NIST, 2004), the non-interoperability, among many other harms causes repetition, cause errors and result in losses. This sort of initial interpretation and reasoning is in agreement with almost all of the literature investigating the implementation of electronic communication in construction (Nitithamyong and Skibniewski, 2004), (Alshawi, Ingirige, 2003), (Finch, 2000) and many others.

But a subsequent research into the literature of different domain which is the communication media triggered a connection between the aforementioned phenomena and few of the well established communication theories. Accordingly the case studies were analysed in view of these findings and in terms of the communication tools being expected to satisfy the project holistic objectives and success criteria
Many reports have emphasized the importance of Interoperability (NIST, 2004) which means to try to integrate all of the project information and decision support data into one digitally provided database, accordingly all communication which takes place through other media is considered as a cause for errors, loss, and the need to reproduce. This paper likes to re-discuss the term of virtual project management, as we all as project managers when we started using the web based communication in our construction site inspired by web based capabilities (Alshawi, 2002), most of us anticipated, or rather dreamed of, a future in which virtual project managers would dominate and replace the traditional ones, but now we all realize that this is not the case. Nobody can tell for certain, how the future of this profession will look like, but it could be stated, with a reasonable degree of assurance that in future project management the 'other' means of communication will survive side-by-side with virtual application of project management.

The transmission theory from mass media communications (DeFleur and Ball-Rokeach, 1989) states that throughout the human history, at the invention of every new

communication media such as the writing, printing, radio, TV…etc, people tend to think at the beginning that this new media would dominate and replace all the other media, but what happens after a while is that they come to a state of balance in which all media will coexist, each will fill a different gap, and they even tend to 'support, each other. The closest example to this is the invention of Television, still living the people who witnessed that, and they were anticipating that it would totally supersede and that radio and journals would eclipse, years later, TV programmes got used to be listed and discussed in the daily newspapers. Some TV programmes discuss the articles of the magazines. None of us can do without a radio in his car.

The same thing is happening with the internet, almost all of us celebrated the advent of the internet, and we were so confident that it would replace all the other media. Many futuristic publishers, for example have written many articles about how the new web digital book will replace the paper book, but what happened is that web sites like amazon.com flourished by selling traditionally printed books over the internet. A very unique totally unexpected formula of coexistence has emerged.

All the aforementioned is not a paragraph of a futuristic realistic magazines about the development of the human civilization, it is very much related to what we encounter in our every day construction project experience, the first author, for example when considered to go for PhD, was fully enthusiastic about the use of digital communication, emails, web-based in the communication plans in the project he manages, and the anticipated future was the "virtual project management", well, the soft analysis (Checkland, 2002) of the case studies on one hand, and the re-interpretation of the results in view of the transmission theory of communication (Mouhanna, 2004) on the other hand, have revealed a completely different perspective.

Nobody can tell for sure how the future of construction communication will look like, what we are certain of and we need to 'consider' in our investigations in this direction is that the 'other' communication media will continue to co-exist together and interacting effectively and efficiently with the recently introduced most advanced forms of web-based. Project managers should be aware of that while putting and implementing their communication management plans, trying to find the most effective communication tool is different between one application and the l other, they need to apply situational communication in the same way they were trained to apply 'situational leadership'. Face to face meeting might be the best when discussing strategic decision making with the client, supported by data from the electronic web based database. Loud voice and signs are irreplaceable while concreting the roof slab at a remote construction site, as nobody would expect such communication to be 'digital'. All of this which seems to be common sense was not as clear to us before at the advent of the internet, calls from everywhere for the sake of interoperability (NIST, 2004) to probably digitize everything, If interoperability between different software is needed but to have to find ways to maintain interoperability between the information conveyed via the other communication media and the web based one, these ways which we need to invent need to be nD based originating from a 'paradigm' of nD communication.

2 Literature Review of Communication Theory

2.1 Definition of Communication

The communication was there because of the humanity need "to share the meanings", (DeFleur, 1989), and is involved almost in all human activities, which makes it difficult to understand and consequently to define (Littlejohn, 1999). It can be simply defined as the sharing of information (Wikipedia), Dance, and Larson, 1976 listed 126 definitions, and Hopper, 1976, made this analogy between the study of communication and the circle, as both of them have neither beginning nor end. There is no logical place to start telling you about it, but as Clevenger, T., 1999 wondered: "Can one not communicate?" author appears followed by “et al.” in italic, a comma, one space and then the year of publication. In the case of more than one articles referenced as shown in the above example, a semi colon (;) has to be added in between followed by one space.
Even though it is called the literature review section, the actual title of the section 2 does not have to be “Literature Review”. It can be other titles that might better represent the content of this section.

2.2 Development of Communication Media

The progress which humanity has witnessed since thousands of years was due to the evolution of many disciplines, communication (language, writing, printing, media, computer and internet) is one of them, but the progress achieved in the last fifty years is mainly due to advances in communication. And we are still very much behind in terms of:

Making best use out of all of these communication advances.
Understand the interaction between these advances on one side and our social life in its holistic definition.

DeFleur, 1989 finds that it is most appropriate to understand the whole human history through the transitions that took place during the human communication different phases, each of which caused deep effects into the life of the individual and the life of the society.

Human communication started using different forms of language, many researchers propose that hand signals were the first form of human communication (Corballis, 2002) till the Homo sapiens started using the ‘spoken’ language some hundred fifty thousand years ago (Lieberman, 1998), while others confirm the widely use of spoken language some thirty five thousand years ago (Defleur and Ball-Rokeach, 1989).
After the use of the initial forms of spoken language, five thousand years ago the invention of written or rather drawn symbols as an abstract indication to represent actual things or concepts (animals, plants…etc.), the Somers, 1700 B.C. linked between symbols and sounds instead of concepts and words started to emerge till the first alphabet in Ugarit some 700 B.C. (Mouhanna, 2002).

During the evolution of writing which started on stones, another direction of evolution was that of the media resulted in the production of paper by the Egyptians and Chinese

2500 B.C., till the year 1455 when Johannes Gutenberg (1400-1468) invented the printing which marked a new era in the communication history, which led to publishing of books, and later on newspapers which can spread the news, the ideas, to different geographic places and yet retain them for next generations to come, and penetrating through all classes of the society (Mouhanna, 2002) then came the radio and TV and most effectively lately the internet.

It could be concluded that the human history can be read and classified through the follow up of the communication developments, this mechanism of interaction between the communication media and the society explains many of the changes that happened throughout the history and helps to predict the future in light of the communication evolution.

Each of these steps in the history of communication changed the way civilisations develop altogether. The change caused by the internet on the communication and the civilisation in general, and the realisation of that change, are both yet to be revealed.
As an example, what printing had done by allowing more people to read the same information within a short time of being produced for the first time, gave chance to philosophers like Kant to shape the thinking of Europe, and for Rousseau to prepare the society for the French Revolution. Nowadays even thinking simply, or even primitively, linearly in the same direction, it would surprise us what consequences will be realized when internet starts to change the world gradually by allowing much more people to read the information and a t much faster pace, both compared with printing. This research hopes to be part of that effort to realize the effect of internet in the society (the construction project and its environment) if implemented in the construction industry.
It is widely believed among communication researchers (Defleur, 1989, Mouhanna, 2002) that it is very difficult this moment of time to estimate or realizes the effects of internet on the social life or the human mind, but what is for sure is that the technical changes in the processes of knowledge creation and transfer have been the main causes of gradual but dramatic changes in the human life which led to changes not only in the knowledge processes but also in the way people think (Defleur, 1989).

The web technology impact is mysteriously but surely anticipated to be similar to the way in which the invention of printing in Germany in 1455, through which the door was opened for all people to read, not only through churches and similar institutions in which the manuscripts used to be shelved for the elite as used to be the case before, which led to deep social and cultural changes which re-routed the history of mankind in Europe and the whole world.

Each step of evolvement in the communication media history meant new capabilities added to the communication system to do;
Using language meant the capability to classify, analyse, synthesis, think deeply, remember, and send / receive long messages.
Writing meant mainly to be able to send messages through time and space, in other words to communicate between different places and between two different periods, this was not possible before the man knows how to write.
Printing meant:

More distribution through time, place, different societies, different classes.
The aforementioned led to major changes in human society.
Much less errors if compared with repetition by handwriting.

Inventions like TV have changed the way people live, much more than what inventions like space rockets or space shuttles did, the same analogy would apply when we compare the application of simple, but stable web based communication applications, when compared with the sophisticated application of integrated solutions (ElSaboni, et al, 2008).
We have to remember that each communication tools, has got characteristics not possessed by the other tools, for example while we can save and retrieve the web based communication, the sign communication or the angry shouting instructions at the construction site are difficult to save, but on the other hand the "content" of that 'angry shouting" could be much more influential and the response (feedback) to it is expected to be instantaneous. The way the contemporary project managers are taught and trained does not sufficiently address some of the most effective tools which used to work very efficiently by our ancestor project managers who used to shout , fight , sometimes as a substitute of good planning. Content wise' planning should not replace common sense; it needs to be merged with it.
Communication tools available need to be investigated in the following directions:

Content : the capability to carry, starting from technical, reaching up to emotions
Saving and retrieval.
Ease of use.
Speed.
Number of use.
Accuracy.
Documentation.
To what extent it could be filtered or distorted while conveying the message.
Referencing in the future
Culture of sender, receiver and communications tool (in order to consider the culture of the environment who invented this communication tool or in which it thrived).

If we consider these aforementioned factors, we shall conclude that each 'situation' might be best fitted by a different communication tool or a combination of more than one.

2.3 Project Communication

The process view of the communication puts it into the model of sender, receiver, and communication media, this model has been adopted by project management writers (Kerzner, 2002), while this model has proven to be valid to represent one single communication process, the need is there to have a holistic view which considers the whole communication action related the project in its context and in relation to the strategic objectives of the project, and consequently build the relation between the communication and the project success in its totality (ElSaboni, et al., 2007).
What authors of this paper are trying to do in this research is to explore those impacts in the construction 'society" due to the introduction of electronic communication.

The communication changes are accumulated and not serially ordered, we still use the signs in our communication till today. many of which are considered as very efficient communication tools while directing construction cranes in construction sites , hand writing is still used, [the case studies conducted in this research prove that face meeting remain as a communication tool, which interacts with the other tools, and that construction management researchers should accept this fact which could be named as nD communication construction , and not to interpret the use of writing , paper based communication as failure or a gap in the construction communication which needs to be upgraded (NIST, 2004) , these different communication tools (web based, phone based , paper based, verbal, face to face , signs ,.. etc) are definitely going to 'live' together, a new combination is evolving , and we 'project managers' the human part in the built environment have to live with it, utilizing it to the best of mankind.

The relationship between the communication tools and thought, in both directions of this relationship, has been well established (Whorf, 1956, Mead,1934 and Bronowski, 1978), in an over simplified fashion, it could be concluded that the today's project manager who uses the web-based communication widely in his construction management practice is anticipated to be thinking differently from one who does not, this difference in thinking leads to different management and might participate in creating variable degrees of misunderstanding and miscommunication between the two schools, the thing we face in our daily practice of project management.

3 The Case Studies and Research Methodology

In this paper the deduction part which is trying to make analogy between the communication theory in Maas Media and the communication in construction project environment, this deduction part has been covered through the discussion of literature review. Coming to the induction part of this research the results of the case studies from ElSaboni, et al., 2008 have been used, the ultimate objective of this deduction/ induction (as mentioned in the abstract) is to validate that the conclusion reached through the critical review literature survey is validated and proven through the findings of the case studies.
The case studies were conducted on few UAE construction projects, the initial purpose was to identify the effect of the use of electronic communication on the success in these projects, the success criteria for UAE projects has been established through a survey and published in 2006 (ElSaboni et al., 2006) while the results of some of these case studies were published in 2007 (ElSaboni et al., 2007), and in 2008 (ElSaboni et al., 2007)
The case study research methodology according to Yin, 2003 has been used and the main unit of analysis of these case studies was the project success as identified in the criteria mentioned, and the boundaries of the cases were different building major projects, the first author used to be a project manager for one of them in which action research mythology has been adopted (McNiff, 2002).

The case studies relied mainly on semi structured interviews and project records.
The epistemology of the first part of the research about perception of project success in UAE (ElSaboni et al., 2006) has been more to the phenomenological school of thought, while the investigation of the best electronic communication system to use in the

construction projects in UAE relied heavily on structured interviews and surveys which belong to logical positivism.

The details of theses case studies and the surveys mentioned are available at the aforementioned two references, and as it has been explained that the purpose of this paper is to present only the re-analysis of results which has been done in light of the communication theory of transmission.

4 Results of Case Studies

The detailed results of the case studies are presented in ElSaboni, 2008 but for the purpose of this reanalysis the following figure will be used from the mentioned reference:

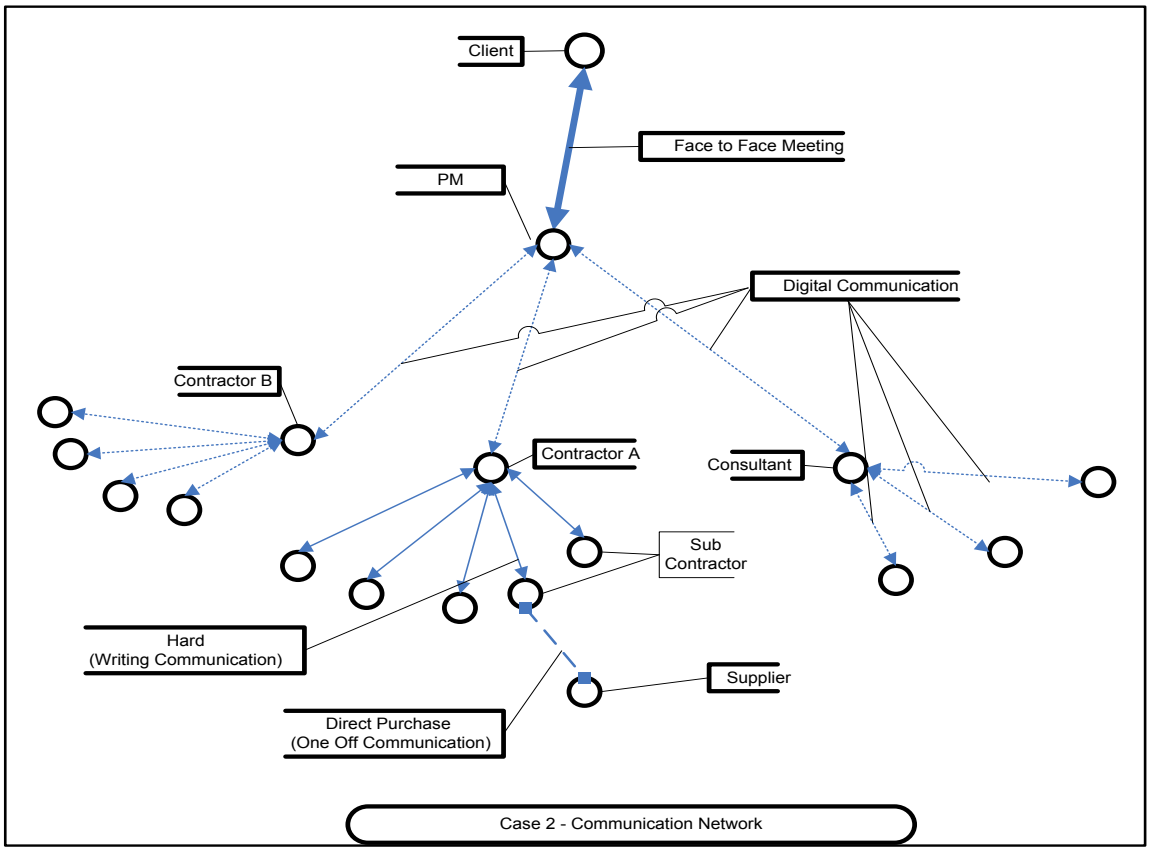

Fig 1 from ElSaboni et al., 2008 shows Communication Relationships, where lines represent the main media of communication. While most of these lines are bi-directional (two way), they can carry instructions downwards only, feedback both directions, enquiries and claims mostly upwards.

In Figure 1, special attention is to paid to the node of the PM project manager and to the arrows connected to it each possibly with a different communication media in this network. This figure demonstrates clearly the transmission theory where different

communication media have coexisted despite the implementation of a web based project wide communication system.

The communication media between the project manager and the client: Face to face meetings.
The written communication and the printed hard copies dominated the contractor communication with most of the sub contractors.
The communication within the triangle of PM-Consultant-Main Contractor relied heavily on web based communication.
Communication media in the construction project is working in an nD perspective (Aouad, 2007).

5 Future Extensions

The transmission theory is not the only communication theory which needs to be investigated in relation to the communication in the construction management, other concepts have been found of extreme potential such as:
The two step flow theory discovered in the 1940's by Lazarsfeld and Katz (1955) during an extensive case study on American presidential campaign, this theory explains the effectiveness of the use of more than one media in a serial communication (DeFleur, and Dennis, 1996), this again was evidenced in the case study by the project manager who used data from web based to make effective face to face meeting with client. Surprisingly this communication two step communication is much more 'effective' considering the strategic objectives of such communication in terms of project success criteria (ElSaboni, et al, 2006) if compared with the client accessing the web directly to get the data he needs.

The gate keeper concept which used to be looked at from a negative perspective when considering the public media (Lowery and DeFleur, 1988) and many others, and this negative consideration survived at earlier research about communication in AEC industry (Guevara and Boyer, 1981)

The social networks analysis theories. "A social network is a set of people (or organisations or other social entities) connected by a set of social relationships, such as friendship, co-working or information exchange "(Garton et al, 1997). Viewing the construction project web network as a social network puts things in their systemic perspective in which this social networking is part of the overall social networking which is supported by the other different forms of communication

The authors do have future plans to investigate in these aforementioned directions, in three fold portfolio:
Reanalysing data of current case studies.
New case studies, particularly based mainly on action research methodology.
Towards developing a framework for construction project communication practitioners.

6 Conclusions

The electronic communication are expected to interact and integrate with the other communication media in the environment of the construction projects, and not to replace them, this mechanism of communication media among the different project stakeholders will help to achieve the strategic project objectives. Project manager is expected to rely on 'situational communication' to select the most effective communication media, and researchers into construction management need to consider this soft nD communication media thinking while investigating about how the future of construction communication will like.

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Towards an Information System Representation of off Site Manufacturing (OSM) in Facilitating the Virtual Prototyping of Housing Design

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Abstract:
Major clients including the British Government have been encouraging the utilisation and application of Standardisation and Modularization (S&M) of Offsite Manufacturing (OSM) techniques for some time now. OSM is currently rapidly evolving resulting in the emergence of an overwhelmingly large number of innovative materials, components, systems, technologies, and methods. However, there is no systematic way for potential users to access this information and knowledge in a manner that can allow them to explore many alternative housing options that meet a wide variety of choices and to select the optimal options. The work presented in this paper is part of a research project aimed at developing a systematic approach for the computerised representation of this information and knowledge in a form that supports the virtual prototyping of housing design. This paper presents a systematic literature review on emerging systems, technologies and methods in OSM. An analysis of the literature which led to the development of a comprehensive classification system for representing OSM information is discussed. Ongoing work being undertaken to develop an information and knowledge repository to support a virtual prototyping environment for housing will also be presented.

Keywords:
Offsite manufacturing, manufactured housing systems, classification system, virtual prototyping.

1 Introduction

There are pressures and high demands amongst the factors that led to the birth of OSM. This has/is continuing with the desire for the quality of housing being the driver. The only way forward in order to meet this demand is through the pursuit of OSM (Egan, 1998). This demand for new houses has greatly benefited the house building industry, which has implemented and used several design and construction improvements to keep up with the tremendous need for new homes around the world. Certainly standardisation

is not a new concept to the manufactured housing industry. Standardisation of measurements and component interfaces within housing is a key theme, because it enables easier replacement of technology in houses along with more rapid implementation of emerging systems. However, it is believed that standardisation in the construction industry may not be applicable as building parts vary and are not unique as in the motor industry for example. Japan offers the best example of recent experiments with the variety of types of traditional and industrialised house building techniques. The Japanese market is substantially large and quite different from that in the UK (Bottom, et al, 1996). Recently, there has been an increase in performance standards and requirements as found in the recent changes in the UK building regulations which have lead to the emergence of large a number of innovative materials, components, systems, technologies, and methods to meet criteria set by these recent changes. However, there is currently no systematic way for potential users to access the information and knowledge in a manner that can allow them to explore many alternative housing options that meet a wide variety of choices and to select the best option. The aim of the research presented is to develop a systematised approach facilitated through a virtual prototyping environment. The rational of this research is captured from the fact that the knowledge of OSM is still not yet systematised, which makes it difficult for both clients and all stakeholders in the UK construction industry and around the world to be able to make appropriate choices of construction methods. The research therefore aims to develop a systematic approach for the computerised representation of this information and knowledge in a form that supports and facilitates the virtual prototyping of housing design.

2 Overview

2.1 Definitions and Terminology

The purpose of this review section is to introduce unification and to illustrate the concept of offsite manufacturing and the related terminologies as well as the definition of virtual prototyping. A superficial history of OSM has also been reviewed to establish the existence and origin of such a concept and why it was necessary at the time of inception. The driver for such a concept which emerged during the World Wars was principally in response to the housing shortage and is still in existence today.

Today, there are high pressure demands for housing in numbers and quality which led to the birth of OSM. The only way forward in order to meet this demand is to pursue OSM (Egan, 1998). Currently, as well as historically, the problem of housing is not only the shortage of accommodation, but is also concerned with the quality, finish and the impersonal character of the dwelling units that are in disrepair (Malpass and Murie, 1994). The Construction Industry Training Board estimates that the industry needs 88,000 recruits every year for the next five years (Burwood and Jess, 2005). This skills shortage will be exacerbated by the increased levels of construction outlined in the Sustainable Communities Plan and prestigious large-scale developments, such as the 2012 Olympics, which will absorb significant manpower resources. Furthermore, the housing supply in the UK presently stands at 175,000 per annum and yet the demand stands at 230,000 per annum (Postnote, 2003). These are some of the issues that were identified in the early stages of the research that led to present the research being pursued.

Before going any further, it is important to define and understand all terms related to manufacturing housing. There is currently a proliferation of terms associated with Modern Methods of Construction (MMC) in practice. Ross and Richardson (2005) state that “there is no precise or universally agreed definition of what constitute modern methods”. MMC is defined in The Post Note from the Parliamentary Office of Science and Technology (2003) as “the manufacture of house parts off-site in a specially designed factory”. Therefore it is important to understand the relationships between MMC and OSM. Figure 1 illustrates the relations related to MMC. There is no doubt that OSM is the heart of MMC and of course MMC is not a new phenomenon. As depicted in Figure 1, MMC is the master key for all OSM, On-site Manufacturing and Traditional Construction, which mates' main focus on this research is OSM. Many have previously sought to define Off-site Manufacturing (OSM) or to use other terms to describe the basic principles behind it. Some have used the term OSM, while others have used the term of Off-site Fabrication (OSF). BURA (2005) describe OSM as “the part of the production process that is carried away from the building site in factory conditions”. Another clear definition for OSM is the “description of the spectrum of applications where buildings, structures or parts thereof which are manufactured and assembled remote from the building site prior to installation in their final position”(Gibb and Goodier, 2005).

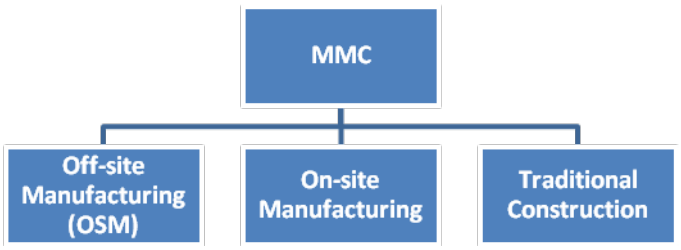

Figure 1 Source relations related to MMC: BURA Report 2005.

2.2 Virtual Prototyping and computer application tool

Over the years, since the initial emergence of computer aided design (CAD) in the 70s, the emergence of Information and Communication Technology (ICT) has rapidly revolutionised and transformed the construction industry. Brandon and Hampson (2004) considered that virtual prototyping (VP) would have the highest likelihood of becoming the basis for design, procurement and asset management in the next 5 to 10 years, which provide the opportunity to try and exercise the design. Virtual prototyping is an electronic representation to facilitate all relevant decisions which can be made and the procurement processes can develop. Virtual prototyping in software development is rudimentary working models of a product or information system, usually built for demonstration purposes or as part of the development process. As defined by Wang (2002). “virtual prototype is a computer simulation of a physical product that can be presented, analyzed, and tested from concerned product life-cycle aspects such as design/engineering, manufacturing, service, and recycling as if on a real physical model. The construction and testing of a virtual prototype is called virtual prototyping”. Currently virtual prototyping technology is available but not sufficiently integrated

(Brandon and Hampson, 2004). OSM and VP should become sufficiently integrated by encourage more users.

Design environment software such as CATIA (Computer-Assisted Three-Dimensional Interactive Application) has improved the development among different products around a visual prototype. CATIA, which has been adopted for this research, is widely used throughout the engineering industry, especially in the automotive and aerospace sectors in where it equates to approximately 70 % of the market. Many companies within the construction industry are also using CATIA in the form of Digital Project which has been adapted from the aerospace and automotive industry for the purpose of the construction industry. OSM processes are assembled by standard components same as aerospace and automotive industry. This software has been adapted by the famous architect Frank Gehry who is renowned for producing a string of exciting and unique designs including the Guggenheim Museum in Bilbao and the Walt Disney Concert Hall in Los Angeles. Frank Gehry works through a number of phases which include drawing, analysing function, sculpturing, determining needs and experimenting with new materials in complex buildings. The design process defies normal conventional design and the complexity of the product requires new methods of representation and manufacture. This is particularly so with regard to future planning and alteration of the finished product (Brandon, 2004).

2.3 Systems categorisation of OSM

Just as there are slight differences in the definition of OSM so there are different classifications. Off-site manufacturing can be classified in various ways and may involve key services such as plumbing, electricity, and so on. In addition, it can also be classified by material, such as timber, steel, concrete and masonry) (Burwood and Jess, 2005). OSM classification system is supporting the VP approach to develop the base of the systemised knowledge and information of SOM. This section examines and reviews a number of different existing classifications including Wallace W Williams (Modular Classification), Gibb (Types of Pre-fabrication), Housing Corporation Construction and Keith Ross's Classification. Different authors provide different explanations for each categorisation. The review covers all categories in off-site manufacturing classifications including descriptions for each. Table 1 compares the different views (terminologies) of the classifications that have been identified for off-site manufacturing. As shown, each of these sources uses different terms for the classifications. Table 2 shows the relationship between the authors' classifications systems and the categories.

Table 1. Comparison of off-site manufacturing classifications

Williams's Modular Classification	Gibb Classification	Housing Corporation Classification	Keith Ross classification
Modular volumetric building	Volumetric off-site fabrication	Off-site manufactured – Volumetric	Volumetric construction
Modular Hybrid-volumetric building	Non-volumetric off-site fabrication	Off-site manufactured – Hybrid	Panellised systems
Modular system building	Component subassembly	Off-site manufactured – Panellised	Hybrid construction
Modular elemental building	Modular building or Whole building	off-site manufactured – Sub-assemblies and components	Sub-assemblies and components
Modular timber building			
Modular pre-fabrication/component building			

Table 2: the relationship between the authors and the categories

OSM Categories	Williams	Gibb	Housing Corporation	Keith Ross
Volumetric systems	√	√	√	√
Hybrid systems	√		√	√
Panellised systems	√	√	√	√
Sub-assemblies and component systems	√	√	√	√
Modular(whole house) systems		√		

Table 3 presents the analysis and conclusion from Tables 1 and 2. At this section classification terms are studied and analysed in order to establish a new and comprehensive OSM classification. This new classification comprises all the clear definitions (systems) of off-site manufacturing. For example, Gibb classification includes the modular systems (whole house) which are not included by the other authors, therefore another larger classification with five categories has emerged. These categories are volumetric, panellised, hybrid, sub-assemblies and components, and Modular (whole house) systems

Table 3. A broader new OSM classification

OSM Categories	New classification	Definitions
Volumetric systems	√	Prefabricated building components in Pods
Panellised systems	√	Prefabricated components in planes or panels
Hybrid systems	√	Combination of Volumetric and Panelised
Sub-assemblies and component systems	√	Simplified components like doors and windows manufactured in factories
Modular(whole house) systems	√	Whole buildings manufactured in the factory. it could entirely be volumetric or penalised or both.

The perspective stems from the fact that knowledge of OSM, is still not yet systematised, making it difficult for clients and all stakeholders in the UK construction industry to be able to make appropriate choices of construction methods. And considering the fact that they had been too many controversies on what constitutes OSM, the debate seems to have split over to the various categorisation of OSM. To this end, different OSM categorisation from different authors have been analysed leading to a final superset category having been generated. This new OSM classification has been developed from authors to provide a comprehensive classification, which includes all the identified OSM categories to be use in VP environment.

2.4 Types of OSM systems presented in virtual prototyping.

OSM (building) systems can use a number of different materials or combinations of materials which can be volumetric, panel or hybrid. A building system is defined as ‘all work components necessary for a particular type of building together with their execution procedures and techniques’ (Warszwaski, 1990). They can be grouped according to method of production, degree of pre-fabrication and structural principles used materials, weight and methods of assembling structural elements, application to different building types, and flexibility of design and their varying permutations. The different systems also take into consideration structural and innovative aspects, e.g. it would be illogical to manufacture a modular building using concrete that has to be transported over a long distance. All systems (panellized, volumetric, hybrid, modular and sub-assembly and components) are explained based on their materials as follows. These systems are presented in a virtual library, to organise the knowledge and information of OSM (see figure 2). These systems are the base/the foundation to present the knowledge and information of the OSM.

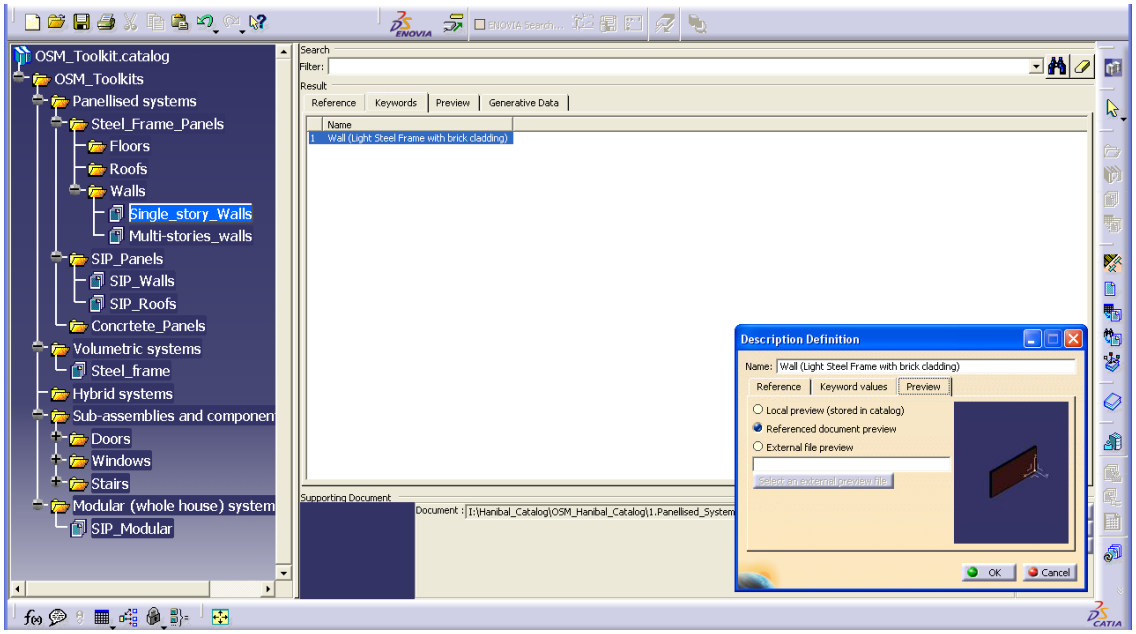

Figure2. The OSM systems in the OSM Library

3 Research Methodology

This study will adopt three methodologies: Literature review, the data collection techniques and the virtual prototyping methodology. As the focus of this research is technical and aims to demonstrate the use of basic OSM concepts in a virtual prototype environment, the main research contribution is geared towards the technical side (solution) for OSM process by demonstrating some VP moulds.

Literature review: to understand the knowledge and definition of OSM and establish the new comprehensive OSM classification system and comparing between computers aided design software to choose the software (CATIA) to apply the in virtual prototyping environment. In other word, Studying and understanding the classification systems of OSM; including materials of the systems and the process of OSM techniques in order to produce the initial functional and specification of the OSM systems to apply it in a prototyping environment.

Data collection techniques: These techniques are adopted in order to collect the relevant state-of-the-art information and knowledge on OSM, which aims to capture this data from exhibitions (i.e. Offsite2005 and Interbuild2006) and by referring to company (product manufactures) catalogues/brochures. Initially, the planned strategy was to adopt a qualitative approach that aimed to collect the relevant data and knowledge from the exhibitions via interviews/surveys with the product manufacturers, and so on. However, due to the large number of companies, the logistics (timeframe at the exhibitions, only non-technical sales people being present at the stalls, and so on) and much of the product knowledge and information being captured within manufacturers' brochures, the qualitative approach strategy was abandoned (for this purpose). Furthermore, many sources such as internet books and periodicals were used to collate the relevant information and knowledge for OSM for housing design. On the other hand, it is proposed to adopt a qualitative approach to enable the elicitation of the

relevant knowledge (such as material, sizes, process, and so on) from and OSM housing designers in support of the virtual prototyping methodology.

Virtual prototyping methodology: this is the core methodology. It facilitates to understand the concept of any project system. Lantz (1986) defines prototyping methodology as “an information system development methodology based on building and using a model of a system for designing, implementing, testing, and installing the final system”. Furthermore, Lantz (1987) elaborates on his theory of prototyping methodology by stating that “prototyping is about people”. Understandably, this falls in line with the consequential rationale and hence objectives of current research. Prototyping enables to “see” a system, “play” with it and “modify” it before it is implemented (Lantz, 1987). Based on this, a methodology will concentrates on the virtual prototyping of prefabricated housing design, which facilitates and correlates different manufacturing processes as well as construction techniques.

The virtual prototyping is being developed based on the comprehensive classification systems of the OSM process previously described through four stages:

Study and understand the classification systems of OSM: this includes materials of the systems and the parts of OSM housing in order to produce the initial functional and specification of the OSM systems and apply it in a prototyping environment, i.e. prototyping libraries. The prototyping libraries are classified into two libraries; materials and OSM (see section 5).

Produce and implement different technical solutions to standard components: four major (CATIA v5) technologies/functionalities (design table, formulas, power-copy and assembly concentrate) are produced to demonstrate the technical approaches such as flexibility to change parameters and less repetition for the users. Furthermore, the knowledge tree for each model organises geometric information for each part of the OSM housing and presents the properties for the materials.

Develop a systematic approach that supports the virtual prototyping of housing design: through multi-case-studies, a systematic approach that facilitates the process of OSM techniques will be established for potential users to access the computerised representation of the information and knowledge (captured from literature) in a manner that can allow exploration of many alterative housing design options that meet a wide variety of choices. These multi-case-studies will be available as libraries in order to select alternative choices in one package.

Testing and validation of the virtual prototyping system: further developing the solution to achieve optimum modelling through user feedback in order to assess the virtual prototyping environment for housing design. This feedback will be captured through a combination of semi-structured interviews and questionnaires.

4 Virtual prototyping representation based on offsite manufacturing knowledge.

This section presents the on-going study being undertaken to develop a VP environment for OSM housing design. Having established a comprehensive classification system, the development and implementation of the two libraries (materials and OSM) within the virtual prototyping environment towards developing a systematic approach that supports

and facilitates the virtual prototyping of housing design are explained. These two libraries are linked by borrow the OSM library from materials library to multi choices to select construction materials. An additional, the OSM Library discriminated with geometry drawing for the systemised classification of OSM (see figure 2).

A virtual prototype is defined as a computer based simulation of a prototype system or subsystem with a degree of functional realism that is comparable to a physical prototype (Haug, Kuhl, Tsai, 1993). Virtual prototyping means the process of using virtual prototypes instead of or in combination with physical prototypes, for innovation, test and evaluation of OSM design, process techniques and materials.

4.1 Materials library

In this section a materials library for construction materials is introduced to complement the available OSM library. This library is classified into five categories; based on the new and comprehensive OSM classification described previously, i.e. architectural facade systems insulated panel systems, ventilated facade systems and conventional construction facade systems. A large number of materials are presented and specified in order to give more value to users. These materials have been chosen from companies' brochures which have been collected from both exhibitions (Offsite2005 and Interbuild2006) and Internet. As an example the library materials shown in Figure 3 is mostly used for façade systems and insulated panels. A materials library is adding new value to the software CATIA, by providing more choice to the library.

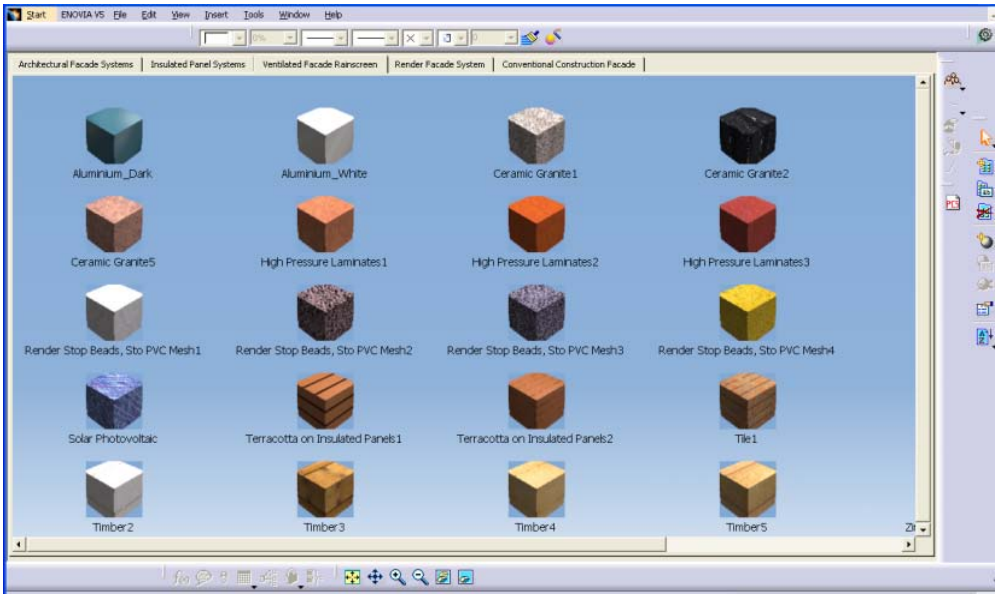

Figure 3. Illustration of the library for Façade and Insulated Panel materials.

4.2 Standardised components and measurement.

Components and Measurement standardisation is an effort to achieve product and system commonality to simplify the installation and replacement of building components and building systems, and to improve compatibility with other building systems. Standardisation of components and dimensions or measurement in CATIA is a powerful tool that can promote various degrees of customisation by facilitating design

alternatives with a structure. Figure 5 shows an example of Structural Insulated Panels (SIPs), which consist of two outer skins and an inner core of an insulating material to form a monolithic unit. Most structural panels use either plywood or Oriented Strand Board (OSB) for their facings. OSB is the principle facing material because it is available in large sizes (up to 4m x 11m sheets). Many manufacturers maintain a standard panel for ease of transportation and handling. SIP walls that are 12cm thick or 18cm thick, are the standards that are most used in SIP manufactures in the UK. The floor systems used in a SIP system are integral to the structural system. The standard joist floor which may also be referred to as an I-Beam or I-Joist because of it is 'I' shape in cross section is used as standard dimensions. Also the foundations are precast concrete with standard dimensions. All building components are given the correct standard dimensions by using a design table and power copy and the components are assembled in the construction site by using constraint objects. In addition to the visual model, in a powerful tool such as Digital Project the modular work is also represented in a Specification Tree as shown in Figure 4. This example has been selected from the classified OSM library. The rest of the systems are under development through the PhD research study by developing more standardised models of systems after designing, implementing, testing, and installing the final system. In addition, the materials library complements the OSM library in that it enables materials to be selected from the materials library along with the required properties for each part of the component.

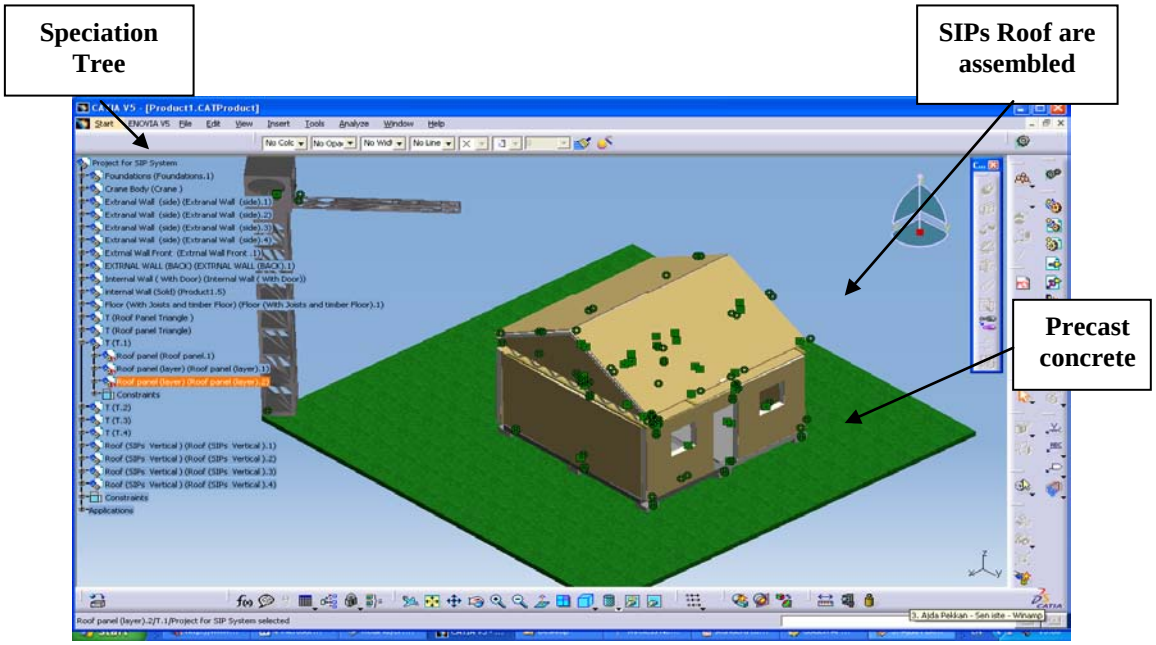

Figure 4. Structural Insulted Panels (SIPs) system assembled on site

5 Conclusion and Further Research

The OSM of housing systems refers to forms of construction undertaken in a factory rather than on a building site. Buildings are manufactured as kit-of-parts or complete product assembly. The work presented in this paper is part of a research study that is focused on the development of an information system that facilitates the VP for the OSM of housing design. Part of the literature review is definitions & terminology of OSM and computer application tool presented in VP. Considering the fact that there had

been many controversies on OSM classifications, a comprehensive new classification is presented. A part of the virtual prototyping libraries are presented in the form of two libraries, which have been developed and implement within CATIA i.e. materials and standard components and measurement libraries. These libraries are just part of a work aimed at developing a systematic way for potential users to access this information and knowledge in a manner that can allow exploring many alternative housing options that meet a wide variety of options. Future work towards achieving the aim of the research will be to further develop the systematic information of OSM housing design in the virtual prototyping environment through the development of more components that can save time for the users, while providing more options (manufacturer's components) to select for OSM design. The process of OSM techniques will be further studied in order to align the virtual prototyping environment with the practice of OSM housing design. Finally, the virtual prototyping environment will be tested and validated with industry OSM designers to assess the applicability of the approach.

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Designing an Arabic-English Bio-ontology for Improved Information & Knowledge Retrieval

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Abstract:
It is becoming increasingly difficult to ignore the impact of ontology in different domains. Ontology has the huge potential to represent and to clarify concepts and inter-concept relationships and can be used as a framework to represent domain concepts expressed in various languages, including Arabic and English. Majority of studies on bio-ontology in the English language have been widely undertaken to highlight the experience of western countries, whilst very few studies have been done to address biologists' information and knowledge needs in the Arabic language. This paper presents the literature review and the proposed methodology for a doctoral research study aimed at designing an Arabic-English bio-ontology.

Keywords:
Ontology, Methodology, Protégé , Ontology tool, DISUS

1 Introduction

The aim of Information Retrieval (IR) is to find and retrieve documents relevant to a given query, usually where documents and query are in the same language. With further advances in research and technology the goal was extended beyond language barriers to include different languages such as Arabic (Abdelali, 2003). The growing requirement for users to access information expressed in languages other than their own has led to the need for designing an ontology to retrieve information in both languages Arabic-English (Salem,1992).

However, people in organizations still face difficulties in searching in the right way to get information in both English and Arabic languages. Moreover, it is difficult to find concrete ontologies within real-world knowledge domains especially in the Arab world, where the search by keywords is poor and the search results are low. Moreover, Arabic is the official language of hundreds of millions of people in twenty Middle East and northern African countries, and is the religious language of all Muslims of various ethnicities around the world (Sabri Elkateb, 2006). Surprisingly little has been done in the field of computerized language. Therefore, a significant need exists to develop an approach towards building a bio-ontology for the search in Arabic-English language.

Most information of biological discovery as (Muller, 2004) is stored in descriptive, full text documents. Distilling this information from scientific papers manually is expensive and slow, if the full text is available to the researcher at all. We therefore aim to develop a useful text-mining environment for full-text articles that allows an individual biologist to locate efficiently information of interest. As stated by (Stevens, 2000) biological data can be very complex not only in the type of data stored, but in the richness and constrains working upon relationships between those data. When designing a database it is useful to be able to describe what values can be specified for which attributes under which conditions.

Therefore, in this research, a specific ontology is presented which conceptualizes knowledge in the biology domain. This will be refereed to as the "biology ontology". The ontology is composed of a high level main ontology specialised into sub-ontologies. The biology ontology enables computers and humans to make sense of text-based resources and process information in a meaningful way. In the last decade, the word ‘‘ontology’’ has become a fashionable word inside the Knowledge Engineering Community. Many definitions have been reviewed in literature about what an ontology is and it is obvious that these definitions have changed and evolved over the time (Corcho, 2003).

This paper comprises of three main sections, namely the literature review, research aim & objectives, and the proposed methodology. Within the literature review section, firstly various definitions of ontology are presented. Secondly, related work on ontology development methodologies are presented, followed by specific ontology development methodologies in Medicine and Biology. The next section of this paper presents specific aims and objectives of the intended doctoral study. The proposed research methodology is presented afterwards. The paper concludes by presenting a summary and the way forward.

2 Literature Review

2.1 What is Ontology?

Various definitions of what forms an ontology have been formulated and have evolved over time. A good description of these can be found in (Corcho, 2004). From the author’s prospective, the best definition that capture’s the essence of an ontology is most referenced by (Gruber, 1994):’ an ontology is a formal, explicit specification of a shared conceptualization’ Gruber explains that he understands it as ‘a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents’. (Welty and Guarino) extends this definition: ‘An ontology is a logical theory accounting for the intended meaning of a formal vocabulary, i.e. its ontological commitment to a particular conceptualization of the world. The intended models of a logical language using such a vocabulary are constrained by its ontological commitment. And as they added that an ontology indirectly reflects this commitment (and the underlying conceptualization) by approximating these intended models.

An ontology typically consists of a hierarchical description of important concepts in a domain, along with descriptions of the properties of (the instances of) each concept.

Ontology identifies and specifies concepts and concept relations using its main components such as Classes, Relations, Axioms, Functions, and instances. These relations are represented in Ontology languages (Turk, 2006). Ontologies are intended to be used as a shared means of communication between computers and between humans and computers. A core requirement for the achievement of this goal is the usage of open standards and technologies for the representation, description, access and exchange of the ontological sources (Hartmann et al.,2007).

A definition given by (Gruber 1993; Gruber 1998) describes Ontology as "a formal, explicit specification of a shared conceptualisation". Ontologies provide a model/representation of the real world through concepts, entities, attributes, relationships, all connected via a semantic network (Sheth 2003). According to (Guarino and Welty, 2001), the accepted industrial meaning of "ontology" makes it synonymous with "conceptual model". Ontologies can and have been built with taxonomies as their starting point and backbone (Miller 2004). (Uschold and King, 1995) provided a new definition of the word ontology to popularize it in other disciplines: ''An ontology may take a variety of forms, but it will necessarily include a vocabulary of terms and some specification of their meaning. This includes definitions and an indication of how concepts are inter-related which collectively impose a structure on the domain and constrain the possible interpretations of terms.''

2.2 Related Work

As reported by (Corch et al., 2003) and (Rezgui 2007) a variety of methodologies have been developed in relation to these ontologies. These include:

a) Methodologies for ontology building (Blazquez et al., 1998; Pinto and Martins, 2000; Holsapple and Joschi, 2002; Kayed and Colomb, 2002; Sugumaran and Storey, 2002; Haava 2004; Gruninger and Fox, 2005)

b) Methodologies for ontology reengineering (Klein 2001);

c) Methodologies for ontology learning (Kietz et al., 2001; Aussenac-Gilles et al., 2001; Cimiano and Volker, 2005);

d) Methodologies for ontology evaluation (Kalfoglou and Robertson, 1999; Guarino et al., 2000; Kietz et al., 2000; Gomez-Perez, 2001)

e) Methodologies for ontology evolution (Klein et al., 2001; Klein et al., 2002; Noy and Klein, 2002; Stojanovic and Motik, 2002); and,

f) (f) Methodologies for ontology merging (Klein, 2001; Stumme and Maedche, 2001; Ganter and Stumme, 2003; Euzenat, 2004).

The co-existence of numerous methodologies suggests that a consensual methodology is difficult to establish due either to the lack of maturity of the field (Lopez, 1999) or the difficulty of developing a methodology adaptable to different applications, sectors, and settings. For instance, most of these methods and methodologies do not consider the collaborative and distributed construction of ontologies. Few methods(Euzenat 1996; Holsapple and Joshi, 2002) include a proposal for collaborative construction of consensual ontologies primarily using domain experts. They include a protocol for agreeing new pieces of knowledge with the rest of the knowledge architecture.

3 Existing Ontology Development Methodologies in Medicine and biology

Researchers in the ontology-design field have developed the content for ontologies in many domain areas. This distributed nature of ontology development has led to a large number of ontologies covering overlapping domains (Noy et al., 2003). The emphasis is on the ontologies designed and developed in medicine and biology, Research on ontologies is becoming widespread in the biomedical informatics community. At the same time, it has become apparent that the challenges of properly constructing and maintaining ontologies have proven more difficult than many workers in the field initially expected. Discovering general, feasible methods has thus become a central activity for many of those hoping to reap the benefits of ontologies (Yu, 2006)

Theodosiou et al., (2005) has examined the impact of the functional annotation of genes as an important task in biology since it facilitates the characterization of genes relationships and the understanding of biochemical pathways, explained the methodology of annotation of genes that is Classification models are constructed by Linear Discriminate Analysis (LDA) and the validation of the models is based on statistical analysis and interpretation of the results involving techniques like hold-out samples, test datasets and metrics like confusion matrix, accuracy, recall, precision and F-measure. Graphical representations, such as box plots, Andrew's curves and scatter plots of the variables resulting from the classification models are also used for validating and interpreting the results .consequently, the methodology will be applied into three phases.

In the same area of explicating medical terminologies (Charlet et al., 2006)described a methodology to build medical ontology from textual reports using a natural language processing tool, the SYNTEX software. The methodology was illustrated in the surgical intensive care medical domain. The methodology as discussed in the article of Charlet as follows. It consists of four steps methodology consists in (1) choice of the corpus, (2) semantic normalization of the terms introduced in the ontology, (3) formalization of the meaning of the knowledge primitives and (4) operationalization using knowledge representation languages in Figure 1.

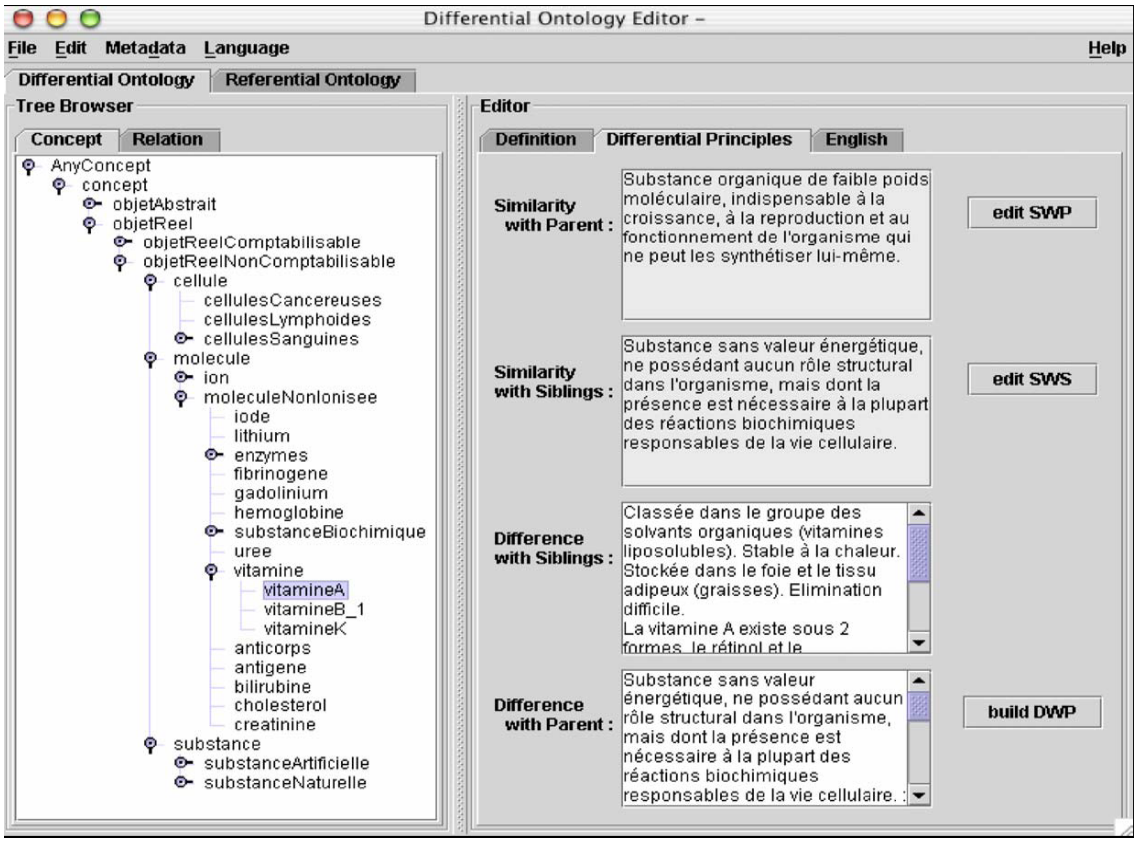

Figure 1. Shows the intensive surgical care ontology editor

Another methodology is the ONtological Integration Of Naive Sources (ONIONS) which is discussed by (Stevens et al.,2002) about ontology integration and has been developed since the early 1990s to account for the problem of conceptual heterogeneity. It addresses some problems encountered in the context of the European project GALEN. http://www.cs.man.ac.uk/mig/galen and the Italian projects SOLMC (Ontological and Linguistic Tools for Conceptual Modeling).

4 Research questions

The main research questions are as follows:

1) Can an ontology address the limitations of current approaches to information retrieval in the Arabic Language?

2) Can ontology deal with the multilingual (Arabic/English) dimension of biological knowledge in general, and the one related to the digestive system in particular?

3) Can a comprehensive ontology dedicated to the Digestive System be developed taking into account the wealth of resources available in the field?

5 Research Methodology

5.1 Why do we need a research methodology?

A research is “systematic investigation to establish facts or principles or to collect information on a subject” (Wikes et al.,1995;Pollard et al., 1994:680) define research as “careful study and investigation, especially in order to discover new facts or information”. (Yin, 2003:20) , describes the research design as “ a logical plan for getting from here to there, where here maybe defined as the initial set of questions to be answered, and there is some set of conclusions (answers) to these questions.

Research studies can be either exploratory in nature, descriptive, or they can be conducted to test a hypothesis about a situation. An exploratory study is usually conducted when no information is available. A descriptive study is usually in order to ascertain and describe the characteristics of the variables of interest in a situation. Hypothesis testing studies usually explain the nature of a certain relationship (Sekaran, 2000).

Cohen (2000) argued the context of educational research as a set of three significant lenses through which to examine the practice of research: (a) scientific and positivistic methodologies; (b) naturalistic and interpretive methodologies; (c) methodologies from critical theories. Furthermore, Cohen suggested that ontological assumptions give rise to epistemological assumption; these, in turn, give rise to methodological consideration; and these, in turn, give rise to issues of instrumentation and data collection.

5.1.1 Philosophical paradigm

Positivism is the oldest of the three paradigms, it underlines what is called’ the scientific method’ the approach to research in the natural sciences (such as physics, chemistry, biology and metallurgy)(Oats 2006)

The positivistic approach to knowledge in information systems is based on objectivity. According to this philosophy there is a possibility to find universal truths and there are observer independent data as facts (Oats, 2006).

From that point and having as a research focus the development and validation of a digestive system ontology in bi-lingual as well as to answer the research question, on consideration of three main philosophies: positivist, interpretive and critical. the philosophical paradigm assumed by this research is the positivist paradigm.

5.2 Proposed Methodology

According to the proposed methodology, ontology is structured into a core ontology and the following sub-ontologies :

1. Function of the digestive system
2. Structure of the digestive system
3. Pathology of the digestive system
4. Physiology of the digestive system

Figure 2 is a diagrammatic representation of the above two case studies to be used. They will be used to drawn from the biology domain involving a real ontology-based system that illustrates effective information retrieval in both Arabic and English language.

Four types of relationships are: (1) ‘‘is a’’ is generalization relationship, which could be used to describe the is a relationship in the class hierarchy. For example, a stomach is a digestive organ; (2) ‘‘part of’’ is generalization relationship, For example, the teeth is part of the mouth; (3) ‘‘composed of’’ is logic or nonmaterial relationship. For example, stomach is composed of gastric glands; (4) ‘‘location of ’’ is ‘‘related to’’ for example, stomach is the location of pyloric sphincter etc …. Mainly, the digestive system ontology depends on four types of relations.

5.2.1 Main stages in the proposed ontology development methodology

The first phase is the building of *glossary of terms* that includes all the terms (concepts, instances attributes, and so on) of the biological domain and their descriptions, When the glossary contained a sizable number of terms, then *concept-classification tree u*sing relations among classes, afterwards identified this domain's taxonomies, and each taxonomy produced an sub-ontology as prescribed by digestive system Methontology Fernandez-Lopez (1999).

The second step is to build ad hoc relations diagrams between concept classification trees. These diagrams establish relationships between concepts of the same sub-ontologies. They will set out the guidelines for integrating ontology.

Despite the researcher’s background in biology, several activities were conducted in relation to knowledge acquisition. Although the researcher’s native language is Arabic, an expert in Arabic language will be consulted for increase accuracy and they are as follows:

1) Preliminary meetings were held with an expert biologist to look for general, not detailed, knowledge. The depth of these meetings was maximal; we were looking for the coarse grain-the overview.

2) Documents were studied as well as books & dictionaries related to the biology domain.
3) Some methodologies were reviewed of medicine, molecular biology and chemistry.

The third step translation will take place, from English to Arabic language, and this task will not take a lot of effort and this could be accomplished through consultation of experts in the Arabic linguistic.

Fourth and fifth phase, evaluation and validation of digestive system methodology which is the last stage of the building methodology, this project would be submitted to expert people for detailed inspection and their feedback, their annotations will be in consideration absolutely.

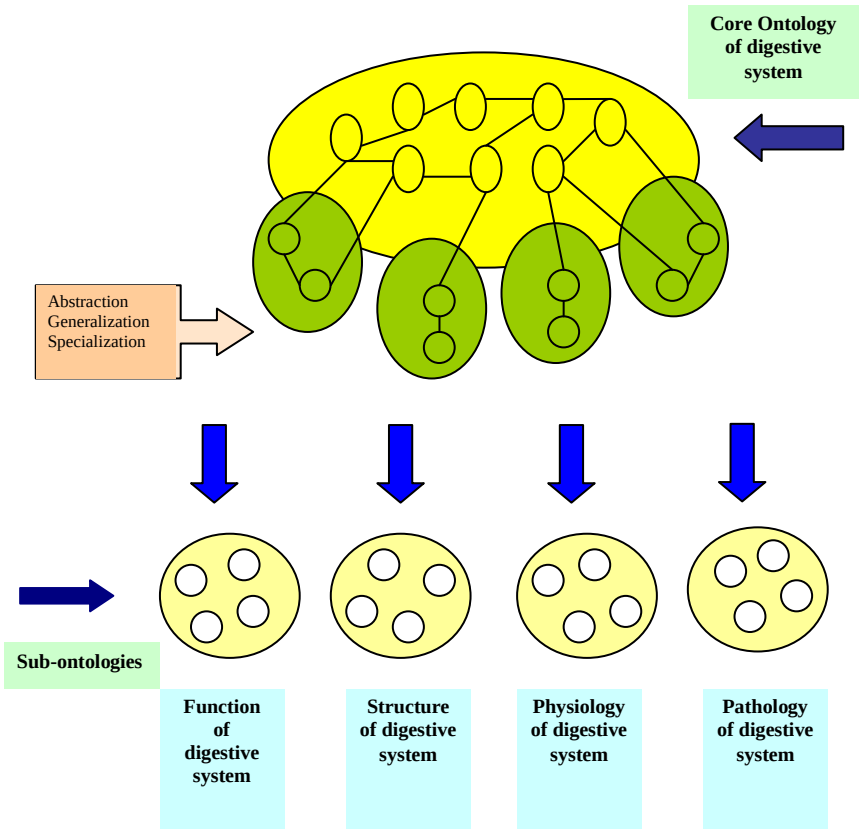

Figure 2. Digestive System ontology

5.2.2 Ontology Development tool

Protégé 2000 (Noy, 2000) has been developed by the Stanford Medical Informatics (SMI) at Stanford University, and is the latest version of the Protégé line of tools. It is an open source, standalone application with an extensible architecture. The core of this environment is the ontology editor, and it holds a library of plugins that add more functionality to the environment. Currently, plugins are available for ontology language importation/exportation (FLogic, Jess, OIL, XML, Prolog), OKBC access, constraints creation and execution (PAL), ontology merge (PROMPT) (N.F. Noy 2000), etc. This tool has been used in the research as the development tool.

6 Conclusion and Further Research

Bio-ontology ontologies are key pieces in the further development of informatics applications in several areas, such as knowledge-based decision support, terminology management, and systems interoperability and integration (Yu, 2006). In presenting the various methods in this paper, it is touched upon philosophical as well as biological concerns that should be considered in endeavours of this kind, in order that we may see the widespread creation of rigorous, useful ontologies. Philosophical ontology has much to offer in terms of formal analytical methods towards creating declarative representations of knowledge that are general, reusable, and valid. At the same time, we need also to draw upon the insights and approaches that have developed within the

biology community, particularly those that are in the Arabic version as they lack the accuracy and development.

The need for an Arabic-English Bio-ontology for Improved Information & Knowledge Retrieval has been developed. A four stages research approach is proposed to conduct the methodology. The next phase of this research will be evaluation and validation of the constructed ontology using case studies.

7 Acknowledgments

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The use of visual angle in car following traffic micro-simulation models

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Abstract:
This paper presents a detailed literature review on car following models and methods used in describing the behaviour between two drivers of successive vehicles travelling in a traffic stream. The paper then concentrates on presenting a proposed car following model based on visual information which are perceived by the driver of the following vehicle. The model represents a modified version of similar models used in the past for describing the "leader-follower" behaviour which depends on the use of visual angle in determining the required spacing between pairs of vehicles. A sensitivity analysis is carried out in order to find out reasonable horizontal angular velocity threshold values which give best representation of driver's reaction time. The capability of the model is then tested to represent the effect of size of vehicles on such threshold values and the required distance between vehicles. Further tests to calibrate and validate the proposed model are needed in order to represent real traffic behaviour using data from selected sites. The proposed model will mainly be used at a later stage in representing traffic behaviour at motorway ramp metering and measuring its effectiveness.

Keywords:
Car following, driver reaction time, traffic micro-simulation models, visual angle

1 Introduction

Car-following models describe the relationship between pairs of vehicles in a single lane. This relationship is represented by several mathematical models which basically describe the effect of the leading vehicle on its follower. The reaction of the driver of the following vehicle is expressed by his/her acceleration or deceleration depending on the leader's speed and the relative distance between the two vehicles.

Results from car following models are as good and as reliable as the assumptions made in developing such models. The sensitivity of these models to any small changes in the parameters and assumptions used has been investigated in this paper. The main focus of this paper is on selecting the angular velocity threshold values used for car following models. This was done by carrying out a sensitivity analysis test on choosing different threshold values and examining the effects on the clear distances left between vehicles

travelling in a traffic stream. The aim of this work is to use the selected threshold values in developing a car following model which will then be used in evaluating "close following" behaviour of drivers within the vicinity of motorway merge sections and looking at ways of improving capacity and reducing delays at such locations.

2 Review of Car Following Models

Car following models are well described in the literature (see for example, Brackstone and McDonald (1999) and Panwai and Dia (2005)). These models can be classified into several groups as shown in the following sections.

2.1 Gazis-Herman-Rothery (GHR) Model

This is known as the GHR model. It represents the earlier car following model which was formulated in 1958 at the General Motors Research Laboratory in Detroit (Chandler, Herman and Montroll, 1958). According to the model, the acceleration/deceleration of the follower is based on relative velocity, relative spacing and the following vehicle's velocity.

Brackstone and McDonald (1999) provided detailed information regarding the choice of the model parameters for different researchers and stated that the GHR model is now being used less frequently because of the large number of contradictory findings for the values used to represent these parameters. Gipps (1981) reported that the model parameters have no explicit connection with drivers' or vehicles' characteristics.

2.2 Collision Avoidance Models (CA)

This is known as the CA model. The original formulation of this approach dates back to Kometani and Sasaki (1959). According to these models, a safe separation distance is assumed to be maintained between the follower and the leader.

Gipps (1981) introduced a car following model based on the assumption that the follower selects his/her speed to ensure that he/she can bring his/her vehicle to a safe stop should the vehicle ahead came to a sudden stop. According to Gipps, the minimum distance between two vehicles is affected by 1.5 times the driver's reaction time.

Benekohal and Treiterer (1988) developed a CAR following SIMulation model (CARSIM) to simulate traffic for both normal and stop and go conditions. Here, the acceleration/deceleration of the follower is based on the follower's desired speed and its engine capability. The model provides a minimum distance between the leader/follower which is equivalent to 1.0 times the brake reaction time.

Hidas (1998) reported that several researchers (e.g. Chen et al., 1995 and Parker, 1996) have found that the assumption of a safe distance is not obeyed by the majority of drivers. This meant that observations from real traffic conditions show that some drivers tend to have "close following" behaviour.

2.3 Desired Spacing Model

According to this model, the acceleration of the follower is a function of both relative distance and relative speed between the leader and follower. Also, it is a function of the desired following distance the follower wishes to maintain. The desired distance is a function of the speed of the follower.

Panwai and Dia (2005) reported that this model presented a good fit to observed data. However, they stated that the main difficulty is with the calibration of the constant parameters used for each individual site. Brackstone and McDonald (1999) gave a detailed investigation of the desired spacing used in the model. Wu et al. (2003) reported that according to these calibrations, the desired spacing in terms of desired time headway has been found to vary from around 0.5 to 1.8 seconds.

2.4 Psychophysical Models

These models consider the ability of human perception of motion which assumes that the driver will accelerate/decelerate depending on a perceived threshold value. Basically, the perceived threshold is related to the difference in speeds or spacing between pairs of vehicles.

Visual angle models are described by researchers such as Brackstone and McDonald (1999) and Panwai and Dia (2005) as one type of psychophysical (or action point) models. Michaels (1963) observed that the detection of relative velocity depends on the rate of change of angular motion of an image across the retina of the eyes of the follower. The visual angle (ɵ) as shown in Figure 1 and its rate of change or angular velocity (dɵ/dt) are calculated as shown in Equations 1 and 2. Once the absolute value for this threshold (dɵ/dt) is exceeded, a driver notices that his/her speed is different from that of the vehicle ahead, and reacts with an acceleration/deceleration opposite in sign to that of dɵ/dt (Ferrari, 1988).

$$\theta = 2\tan^{-1}\left(\frac{w}{2H}\right) \quad \text{…. Equation 1}$$

$$\frac{d\theta}{dt} = \frac{-w*Vr}{H^2} \quad \text{…. Equation 2}$$

Where

H is the clear spacing between the leading and the following vehicles
Vr is the relative speed between the two vehicles
w is the width of the leading vehicle.

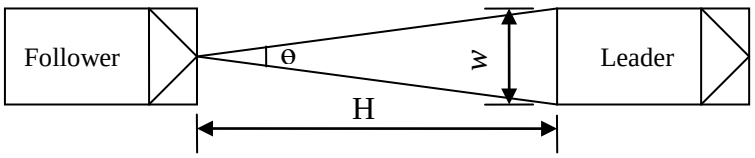

Figure 1. The visual angle Θ

According to Michaels (1963), the visual angle threshold ranges between 0.0003 and 0.001 rad/sec and it is reasonable to use 0.0006 rad/sec as an average value. Fox and Lehman (1967) described a car following model based on the visual angle concept using

a base value of the threshold as used by Michaels (i.e. 0.0006 rad/sec). Ferrari (1989) presented a traffic simulation model for motorway conditions assuming that the angular velocity threshold to be identical for all drivers. He used a value of 0.0003 rad/sec with a minimum time gap between two successive vehicles of 1 second.

Hoffman and Mortimer (1994, 1996) carried out a study to scale the relative velocity between vehicles. They reported that when the rate of change of the subtended angle of a lead vehicle exceeds the threshold value (which is 0.003 rad/sec), drivers have the information available to subjectively scale the relative motion between two vehicles and drivers were able to give reasonable estimate of time to collision.

The second threshold is particularly relevant to close distance (spacing) headways where speed differences are always likely to be below the angular velocity threshold (Brackstone and McDonald, 1999). This is related to the well known Weber's law (according to this law, any change would be noticeable if it exceeds the just noticeable difference (JND) which is usually 10%). Therefore, a driver chooses to accelerate or decelerate in case the spacing is changed by a value of 10% of their desired spacing.

A comparative evaluation by Panwai and Dia (2005) applied on three micro simulation models namely, Verkehr in Stadten-simulation (VISSIM) and parallel microscopic simulation (PARAMICS) representing the psychophysical models and (AIMSUN) representing the collision avoidance model, has been made. The study showed that the first two models (i.e. VISSIM and PARAMICS) gave similar error values when tested using the same site data. These errors were found to be greater than those found using AIMSUN for the same set of data. Both VISSIM and PARAMICS are currently the main traffic simulation software used by industry in the UK for assessing transport impacts.

2.5 Other Car Following Models

There were several other attempts by researchers to model car following using alternative methods. The fuzzy system of the car following model describes a follower's response to the change of relative speed and headway to that of the leader according to his/her own free speed and desired safe following distance. The model divides the variables such as speed and headway into a number of overlapping sets associating each one with a particular term such as 'close' and 'very close'.

Cellular automata models represent simple microscopic models which are straightforward with logic that usually consist of a few integer operations. According to Bham and Benekohal (2004), Nagal (1995 and 1998) reported that cellular automata models do not have realistic drivers and vehicle behaviour models. Because of a high computational resources and the long execution time in car following, Bham and Benekohal (2004) developed a cell based traffic simulation model called CELLSIM using a dual-regime constant acceleration model and two deceleration models. Space in the model was divided in cells of 1 ft (0.31m).

2.6 Summary of Limitations Associated with Existing Car Following Models

From the above brief review, some of the main limitations in car following models can be summarised as follows:

Most of the above models assign a pre-defined single value for each driver as his/her reaction time. Some researchers used two values for each driver to represent the alerted and surprised (not alerted) driver's reaction time for congested and non-congested traffic conditions, respectively. The majority of such models could not represent the follower's reaction time to show how it varies with traffic conditions.

The effect of the size of the leading vehicle on car following is not represented as a factor influencing the distance or time required between the leader and its follower.

In this paper, it is found (as will be discussed in detail later) that using psychophysical or action point models can easily deal with the above limitations, especially if the threshold values for the angular velocity are chosen appropriately.

3 Research Methodology

Traffic simulation models play a major role in allowing transportation engineers to evaluate complex traffic situations and recommending alternative scenarios. Clark and Daigle (1997) reported that such simulation models provide the opportunity to evaluate traffic control and design strategies without committing a lot of expensive resources (including time) which are necessary to implement alternative strategies in the field. According to Kotsialos and Papageorgiou (2001) these models can be used for estimation, prediction and control related tasks for the traffic process. Moreover, computer simulation models can help in analysing everyday's traffic management needs by looking at problems such as congestion and identify their sources.

This section describes the proposed car following model which mainly depends on the visual angle perceived by the follower. The assumptions and the selected threshold angular velocity values for the proposed model are based on the sensitivity analysis tests which were carried out using Excel spreadsheets. This proposed model deals with the limitations presented in Section 2.6 above. The model was developed using Salford FORTRAN-95 in order to be used at a later stage in describing the behaviour at motorway merges.

3.1 Model Parameters

3.1.1 Threshold Values for Angular Velocity

The proposed model is mainly based on visual angular velocity thresholds. For each individual driver, there are two angular velocity thresholds. A positive threshold is for cases where the follower's speed is higher than its leader's speed. However, when the follower's speed is less than its leader's speed, a negative angular velocity threshold is applied.

The sketch in Figure 2 gives examples of angular velocity values for different cases based on calculations from Equation 2. These values are either positive, negative or zero. For cases A and B the angular velocity is positive (i.e. when the velocity of the follower is higher than that of its leader), whereas cases C and D represent negative angular velocities. Case E gives a value of zero for the angular velocity when both

leader's and follower's speeds are equal and is not a function of the distance between them.

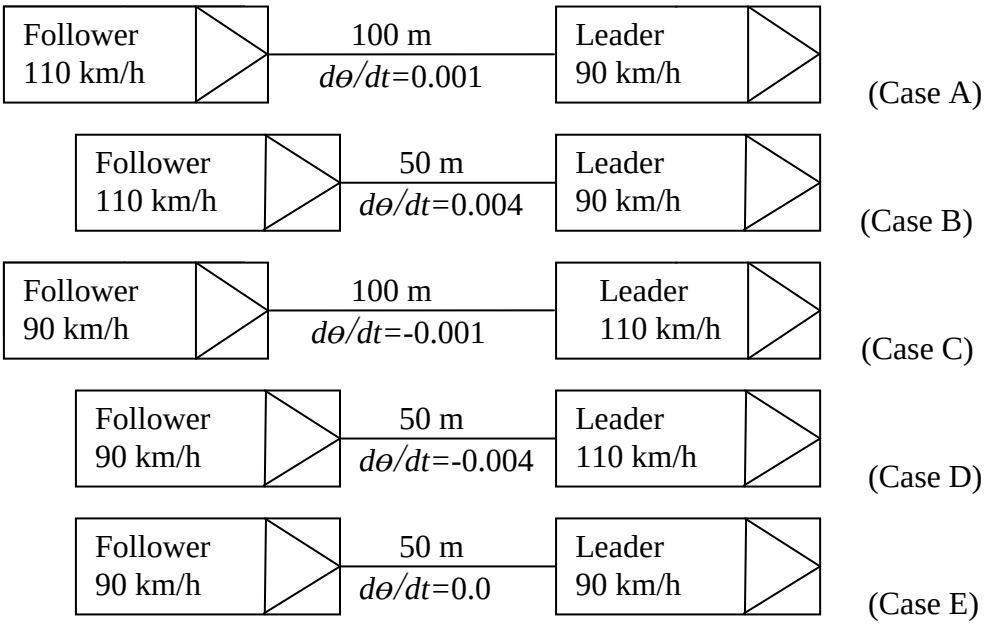

Figure 2. Illustration of positive, negative and zero angular velocities

3.1.2 Time Headway Thresholds

If the angular velocity value is within the two threshold limits described above, the follower may choose to accelerate or decelerate depending on how close (clear time or distance) he/she is from his/her leader.

If the actual clear time between vehicles is less than the minimum time headway threshold (THmin), the driver will decelerate to reach his/her desired minimum spacing. If the maximum desired spacing threshold (THmax) is exceeded, the follower can accelerate to reach his/her desired speed. These desired minimum and maximum spacings may be obtained from site by monitoring close following drivers, over a section of a road, travelling with similar speeds.

3.2 Model Assumptions

The following assumptions are applied to calculate the acceleration of the follower:

(a) If the positive angular velocity threshold is exceeded (i.e. dθ/dt from Equation 2 is higher than the positive angular velocity threshold), the driver will decelerate with a minimum of the following two decelerations.

Maximum comfortable deceleration which is assigned for drivers. In emergency cases, the maximum deceleration rate should be used instead.

A deceleration which is enough for the follower to keep his/her vehicle at a certain distance from the vehicle ahead. This distance is based on preferred time spacing for each individual driver.

(b) If the negative angular velocity is below the minimum negative threshold (i.e. dθ/dt from Equation 2 is less than the negative angular velocity threshold), the driver will accelerate with a minimum of the following three accelerations.

Maximum acceleration which depends on the engine capability of the vehicle.

An acceleration to enable the follower to reach his/her desired speed.

An acceleration to enable the follower to perform his/her desired spacing based on preferred minimum time spacing.

(c) If the angular velocity value is within the two visual angle threshold limits, the acceleration or deceleration of the follower is based on whether or not the follower exceeds the time headway thresholds (i.e. THmax and THmin) as discussed in Section 3.1.2.

(d) If none of the above thresholds are exceeded (i.e. angular velocity thresholds are as in (c) above and the time headway thresholds are within the minimum/maximum limits), the follower will keep a constant speed (i.e. acceleration is zero).

4 Model Applications

The purpose of developing this model is to present the capability of visual angle models for use at a later stage in representing traffic behaviour at motorway merges. This section illustrates some of the main advantages of the proposed model in order to solve the main problems associated with such car following models as summarised in Section 2.6 above (i.e. representing driver's reaction time and the size of vehicles).

4.1 Modelling of Driver's Reaction Time

4.1.1 Background Information on Reaction Time

Reaction time indicates a time lag that the follower uses to react to the change in his/her leader's driving behaviour during car following (Zhang and Bham, 2007). O'Flaherty (1986) stated that the length of perception time varies considerably since it depends upon the distance to object, the natural rapidity with which the driver reacts, the optical ability of the driver and other factors.

Table 1 shows a summary of some of the main work in determining driver's reaction time. It is clear from the different trials to estimate driver's reaction time that there are some difficulties in doing so accurately. Maycock et al. (1999) reported that the key problem of estimating reaction times from driver's responses is that of identifying the start time from which the response should be measured. All researchers shown in the Table (apart from the last one) obtained the values of reaction time from experimental work where drivers were monitored individually on trial sites or in laboratory based experiments. The work by Zhang and Bham (2007) was based on analysing car-following trajectory data using Next Generation Simulation model (NGSIM).

Table 1. Summary of brake reaction time based on previous research

Researcher	Median reaction time (sec.)	Situations
Johansson and Rumer (1971)	0.73, 054	Surprised, alerted
Lerner et al. (1995)	1.44	Surprised
Maycock et al. (1999)	1.2	Unaltered
Zhang and Bham (2007)	0.6	Not specific

4.1.2 Sensitivity Analysis of Brake Reaction Time

In this paper, the value of brake reaction time can be integrated within the proposed visual angle model parameters. This will eliminate the need to have brake reaction time estimated or measured from experimental work or likewise. Moreover, the proposed model represents the brake reaction time as a function of traffic density, relative speed, leader-follower acceleration/deceleration and other behaviours.

The driver's reaction time according to the proposed model is shown in Figure 3. The figure shows the relationship between relative angular velocity and time for different initial spacing between pairs of vehicles. The time is represented from the start of deceleration of the leader with a constant deceleration of -2m/s2. Also, 90 km/h speed is assumed for both of the leader and the follower.

The figure shows that when the traffic density is high (i.e. spacing is low), the follower will react to the deceleration of the leader within shorter times compared with the case of lower traffic density. For example, when the initial spacing is 40 m and for the case of threshold value of 0.003 as suggested by Hoffmann and Mortimer (1994, 1996), the follower will react to the leader's deceleration after 1.1 sec. Whereas for the case of 50 m initial spacing, the driver will react after 1.6 sec.

Figure 4 (which is derived from Figure 3), illustrates the relationship between driver's reaction time and initial spacing between the leader and follower. The figure is based on two selected angular velocity threshold values of 0.003 and 0.0006 rad/sec as suggested by Hoffmann and Mortimer (1994, 1996) and Michaels (1963), respectively.

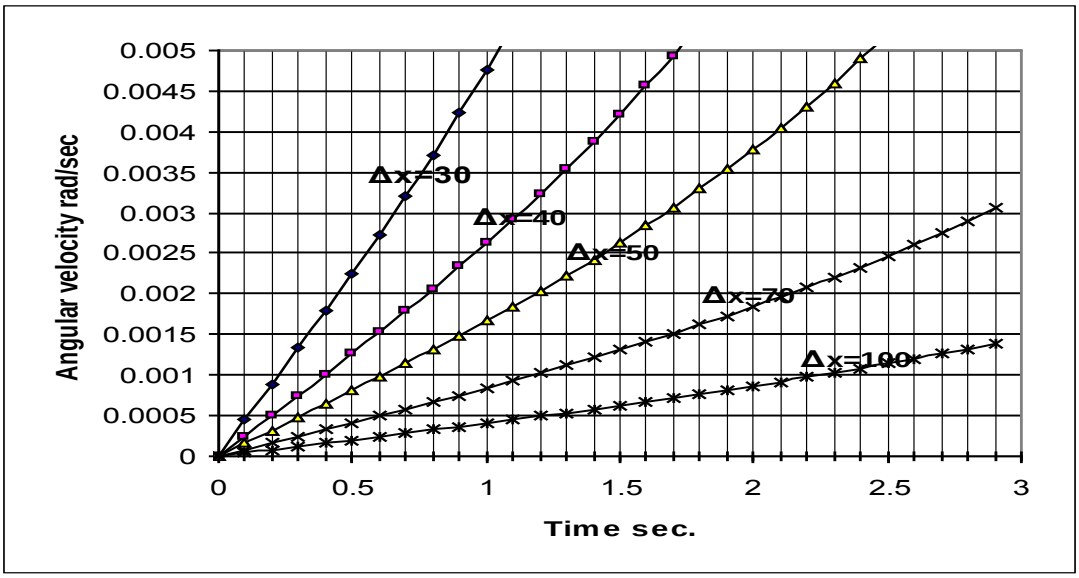

Figure 3. Relationship between angular velocity and time (assuming that leader's constant deceleration is equal to -2m/sec2 for different initial space headways)

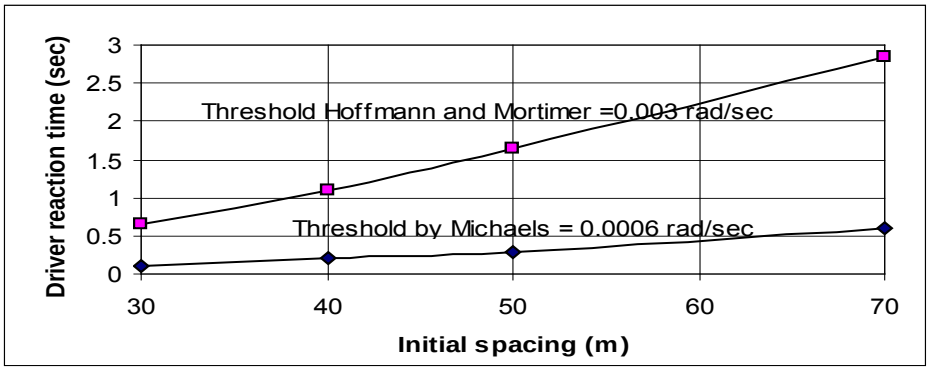

Figure 4. Relationship between driver's reaction time and initial spacing

For relatively high density conditions (i.e. with spacings of say 40 m) Hoffmann and Mortimer's thresholds suggest that the reaction time is about 1.1 sec, whereas the threshold suggested by Michaels yield a value of reaction time of 0.2 sec. It seems that comparing these results with those in Table 1 based on previous literature, the threshold values of 0.003 as suggested by Hoffmann and Mortimer give more reasonable representation for angular velocity models. Therefore, in order to use the threshold values suggested by Michaels, there should be another parameter (namely an extra brake reaction time) which needs to be considered in modelling car following.

The modelling of driver's reaction time for different relative speeds is shown in Figure 5. The results are based on the same initial spacing of 40 m with assumed leader's speed of 90 km/hr (equivalent to 25 m/sec). The Figure shows that for a specific angular velocity threshold value, driver's reaction time decreases as the relative speed increases.

The effect of the follower's characteristic (such as age and gender) could affect the angular velocity assigned to each driver. For example, older drivers require, on average, a higher threshold value compared with younger ones.

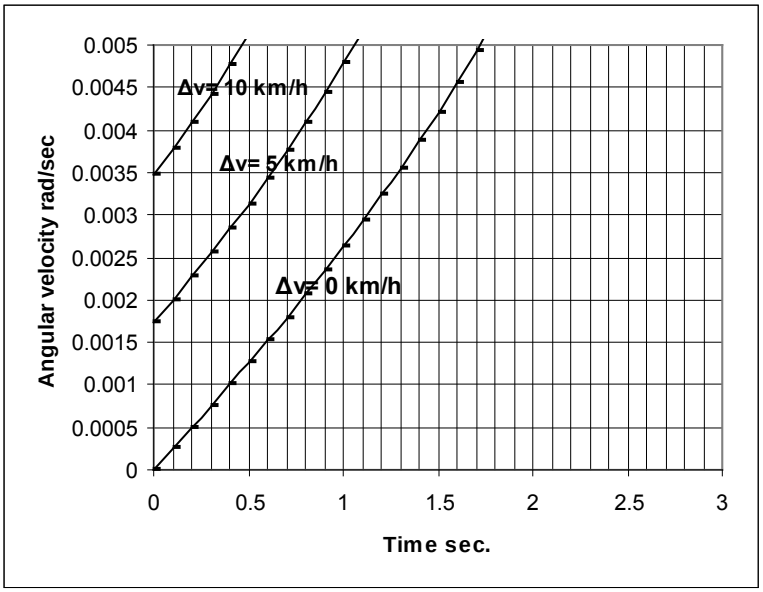

Figure 5. Relationship between angular velocity and time after leader's constant deceleration of -2m/sec2 for different relative speeds

4.2 Representing the Effect of the Size of Vehicles

Based on real data from UK motorway sites, Yousif (1993) reported that some passenger car drivers try to leave sufficient space to avoid visual problems associated with obstructed traffic signs or other traffic control devices on the road especially if they are in the vicinity of roadworks sites and close to exits at motorway junctions. This could contribute to forcing drivers following heavy goods vehicles (HGVs) to leave a much larger space. Parker (1996), when studying the effect of HGVs at three motorway roadwork sites, reported that the presence of HGVs in the traffic stream increases headways, thus reducing the capacity of the road section.

It was shown that most of other car following models, such as collision avoidance and desired spacing models, could not directly include the effect of the size of the leading vehicle. However it is interesting to refer to Yousif's (1993) assumption to include the effect of HGVs by assuming that when a car follows an HGV or when the follower vehicle is an HGV, the absolute maximum deceleration will be reduced by a certain value. This assumption led to having space headways for a Car following an HGV or an HGV following an HGV to be greater than the case of a Car following a Car.

Visual angle models can also take into consideration the effect of the size of vehicles without making any further complicated assumptions. Figure 6 shows the effect of different widths of the leading vehicle on the starting distance for the follower to be affected by its leader. This is based on the assumptions that there is a 10 km/h relative speed difference between the two vehicles and with THmin and THmax equal to 1.6 and 2.0 seconds, respectively.

From the figure, the follower starts applying his/her deceleration earlier if the leader is an HGV (i.e. width = 2.55 m) compared with the case when the leader is a Car. This means that more HGVs in the traffic stream leads to increased gaps between vehicles and consequently reduce capacity

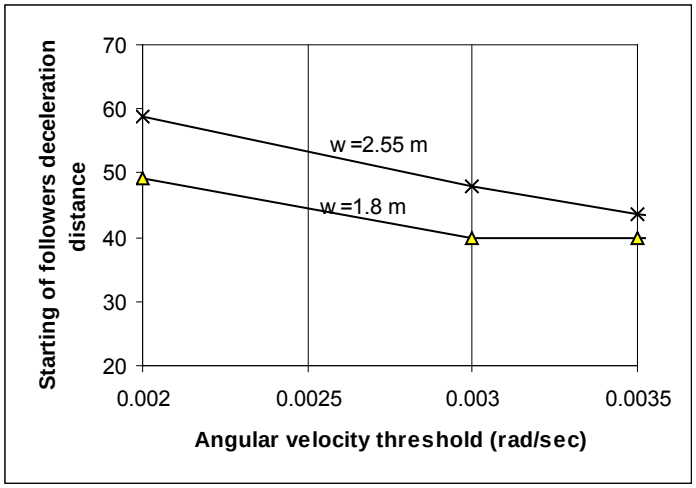

Figure 6. Distance for the follower to be affected by its leader

5 Conclusion and Further Research

This paper presented a car following model which is based on visual angle using selected angular velocity threshold values (dθ/dt). Several threshold values have been examined using sensitivity analysis. It was found that values of about 0.003 rad/sec (similar to those suggested by Hoffmann and Mortimer (1994, 1996)), gave reasonable results when testing the values obtained in representing driver's reaction time.

In addition, there was no need to introduce driver's reaction time as another parameter in the proposed model since it could be integrated within the selected angular velocity threshold values. This will eliminate the need to have brake reaction time estimated or measured from experimental work or likewise.

It was shown that the selection of 0.003 rad/sec threshold value gave reasonable results when the effect of the size of vehicles was to be considered in the modelling process. No further additional assumptions are needed if this threshold (or close to it) was selected.

For further work, it is important to examine the proposed model against real traffic data to test its validity for different traffic conditions (i.e. high to low densities with different operating speeds). The validated model will then be used in simulating traffic behaviour at motorway merges

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Partial Elliptical Two-Regime Speed-Flow Traffic Model Based on the Highway Capacity Manual

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Abstract
There have been several attempts to describe traffic flow behaviour by modelling the relationship between the main variables describing traffic such as speed, flow and density. Some of these models are based on simplistic assumptions and therefore, they are far from being accurate in representing the whole range of traffic conditions (e.g. from free flowing to congested situations). This paper describes a speed-flow traffic model based on a two-regime linear speed-density relationship. The proposed model gives a mathematical representation for the likely speed-flow relationship based on published data from the Highway Capacity Manual. The model is robust and simple to use in describing this relationship for different traffic and roadway conditions. It can be applied in modelling traffic behaviour and used in estimating delays when dealing with stable as well as unstable traffic flow conditions ranging from free-flow to stationary queues. The model is also recommended for use in text books when describing speed-flow-density relationships.

Key words: traffic; speed; flow; density; modelling

1 Introduction

The main variables that form the underpinnings of traffic analysis are speed, flow and density (Mannering *et al.*, 2005). Although there are a number of published theoretical and analytical speed-density relationships, most Traffic Engineering text books refer to Greenshields model which was developed in 1934 when describing such relationships (for example, see Fricker and Whitford (2004), Mannering *et al*. (2005), O'Flaherty (1997), Salter (1986), Salter and Hounsell (1996), and Wright and Dixon (2004)). This is because the model by Greenshields (1934) proposed a simplistic approach by assuming a linear form of speed-density relationship. The derived flow-density relationship gives a symmetrical parabola which has been used later on by Lighthill and Whitham (1955) in describing and explaining what is known as the shockwave phenomenon in traffic streams when traffic density increases suddenly.

Other forms of speed-density relationships are provided elsewhere (see for example, Drew (1965), Duncan (1979) and Pipes (1967)), while Drake *et al.* (1967) refer to a multi-regime linear relationships (i.e. two-regime and three-regime linear speed-density

relationships). From experimental observations, Kerner (1999) showed that there are at least two phenomena of what was called “self-organisation without bottlenecks” in real traffic flow.

Normally, it is difficult to obtain accurate measurements of traffic density directly from sites. Hall *et al.* (1986) used occupancy (spot-density) instead of density in a study on flow-density relationships. Speed and flow values are much more accessible than density and are easier to obtain from site observations. Logically, speed and flow (rather than density) should be used as input values to those models representing traffic behaviour in evaluating the performance of traffic schemes and in estimating traffic delays for cost/benefit analysis.

Therefore, this paper uses parameter relating to speed and flow (such as free speed, maximum flow and speed at maximum flow) which can be directly measured from site in proposing a traffic model for speed-flow relationship. The Highway Capacity Manual (2000) is used as the basis for the data needed for this paper to form the proposed analytical model. This model is recommended for use in describing traffic once its parameters are obtained from site.

2 Capacity and Level of Service (LOS)

According to Wright and Dixon (2004), the Highway Capacity Manual (2000) describes traffic operational conditions using a qualitative measure called Level of Service (LOS). There are several Levels of Service ranging from A to F with varying density range measured in pc/mi/ln (passenger car per mile per lane) as shown in Table 1.

Table 1 Levels of service and density range (adapted from Highway Capacity Manual, 2000)

Level of Service	**Description**	**Density range pc/mi/ln *(pc/km/ln)***	**Average density pc/mi/ln *(pc/km/ln)***
A	This represents free-flow, low flows, high speeds, and low density with little or no delay. Drivers are free to choose their speeds and lanes. **(Stable condition)**	0-11 *(0-7)*	5.5 *(3.4)*
B	Operating speeds begin to be restricted by traffic conditions. Drivers are able to reasonably maintain their desired speed and lane of operation. **(Stable condition)**	11-18 *(7-11)*	14.5 *(9.1)*
C	Most drivers are more restricted by the higher traffic flows and have less freedom to select their own speeds, as well as reduced ability to change lanes or pass. **(Stable condition)**	18-26 *(11-16)*	22 *(13.8)*
D	There is little freedom to manoeuvre with lower comfort and convenience but these conditions may be tolerated for short periods. **(Approaching unstable conditions)**	26-35 *(16-22)*	30.5 *(19.1)*
E	Momentary stop-start conditions may prevail and queues start forming and operations are at or near capacity of the road. **(Unstable conditions)**	35-45 *(22-28)*	**40** ***(25.0)***
F	This represents forced flow operation where speeds are	>45	Varies

	low and flows are below capacity with existing queues approaching traffic jam with complete stand still. **(Unstable conditions)**	*(>28)*	

Table 1 illustrates these levels of service (LOS) and gives the density range associated with each of them as described by the Highway Capacity Manual (2000). The stable and unstable traffic conditions associated with these levels are also identified. Capacity of a given section of roadway can simply be defined as the maximum number of vehicles which can pass a given point in one hour under the prevailing roadway and traffic conditions. Thus, there are a whole range of factors which influence capacity, some of which are related to road geometry while others are related to general drivers' behaviour, environmental conditions and the presence of traffic control devices.

3 Modelling Traffic

According to Kreyszig (2006), modelling is translating a physical or other problem into a mathematical form using an algebraic equation, a differential equation, a graph or some other mathematical expression. It is one of three phases which might be necessary in problem solving and interpretation of results for practical use.

Different models were used in describing traffic behaviour. These models could be analytical (which uses theoretical considerations based on field data), descriptive (which are mathematical models that applies theoretical principles), deterministic (which are mathematical models that are not subject to randomness) and empirical (that uses statistical analysis of field data in describing the behaviour). Computer simulation or stochastic techniques could be used in the modelling of traffic behaviour.

The model used in this paper is a simple descriptive analytical model which is based on published data from reliable sources such as the Highway Capacity Manual (2000).

4 Speed-flow-density models

In this section, two speed-density relationships are considered in more details, namely, the one- and two-regime linear models. Both of these models are simple to use. However, there are other forms of models of more complex nature.

4.1 One-regime linear speed-density relationship

4.1.1 Speed-density

The one-regime linear relationship between speed and density, as represented by Greenshields (1934), is shown in Figure 1.

This relationship is represented in Equation 1, as follows:

$$v = v_{free} [1 - (k / k_{jam})] \text{ ....Eq. 1 (linear form)}$$

where,

v is the space mean speed
v_{free} is the free-flow speed (i.e. the speed on a roadway that can be maintained when no other vehicles are present)
k is the density
k_{jam} is the jam density (i.e. the maximum possible density on a roadway).

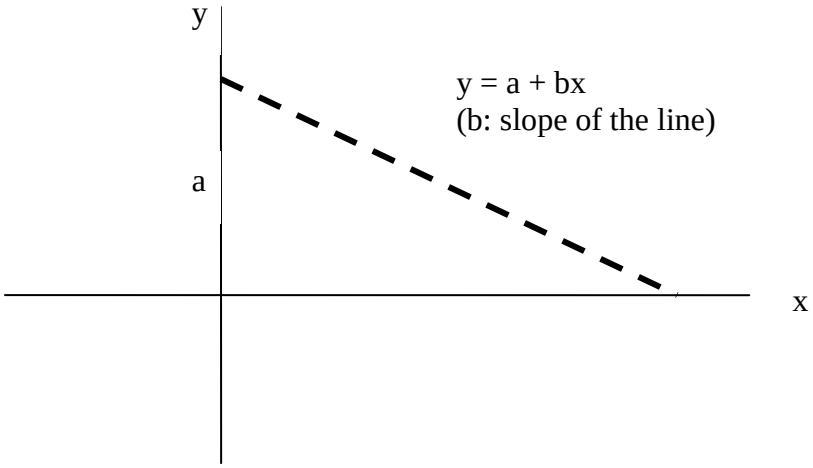

Figure 1 Equation of a line (representing a linear speed-density relationship)

4.1.2 Flow-density

According to Wardrop (1952), flow is the product of space mean speed and density. This is represented by Equation 2.

$$q = k\ v \ldots. \text{Eq. 2}$$

where,
q is the flow

Therefore, Equation 1 could be rewritten as follows:

$$q = k\ [v_{free}\ (1 - (k / k_{jam}))]$$

$$q = k\ v_{free} - v_{free}\ (k^2 / k_{jam}) \ldots. \text{Eq. 3 (parabolic function)}$$

This is a parabolic representation of the relationship between flow and density.

4.1.3 Capacity

Capacity (i.e. maximum flow) is of interest to practitioners such as traffic engineers and transport planners when designing roads and modelling traffic behaviour. In order to find the optimum density (k_{cap}) when flow is maximum (i.e. at capacity (q_{cap})), Equation 3 is used to find the maximum point on the curve by differentiation and setting the terms to zero as follows:

$$dq/dk = 0 \text{ (from Eq. 3)}$$

$$dq/dk = v_{free} - 2k\ v_{free} / k_{jam} = 0, \text{ then}$$

$k_{cap} = 0.5k_{jam}$ (i.e. density at capacity) …. Eq. 4

Similarly, optimum speed (v_{cap}) at maximum flow (q_{cap}) from Equations 1 and 4:

$$v_{cap} = v_{free} [1 - (k_{cap} / k_{jam})] = v_{free} [1 - (0.5k_{jam} / k_{jam})] = 0.5v_{free} \text{ … Eq. 5}$$

To calculate maximum flow (i.e. capacity):

$$q_{cap} = k_{cap} v_{cap} = (0.5 k_{jam}) (0.5 v_{free}) = 0.25 k_{jam} v_{free} \quad \text{….Eq. 6}$$

4.1.4 Speed-flow

In order to find the relationship between speed and flow, Equations 1 and 2 are used to form:

$$k = (k_{jam} / v_{free}) (v_{free} - v), \text{ and } q = k v,$$

$$q = v (k_{jam} / v_{free}) (v_{free} - v) = k_{jam} (v - v^2 / v_{free}) \quad \text{(parabolic function) … Eq. 7}$$

Since speed is dependent on flow (rather than the other way round), Equation 7 could be transformed to show speed as the dependent variable and flow is the independent variable. This will result in a symmetrical shape of a partial ellipse. This representation of the speed-flow relationship is often found in most Traffic and Transport Engineering text books as mentioned earlier.

The mathematical representation for an ellipse in the xy-plane with the centre at the origin can be shown as follows (Kreyszig, 2006):

$$x^2/m^2 + y^2/n^2 = 1 \quad \text{…. Eq. 8a}$$

Where
m is the x-intercept and n is the y-intercept as shown in Figure 2.

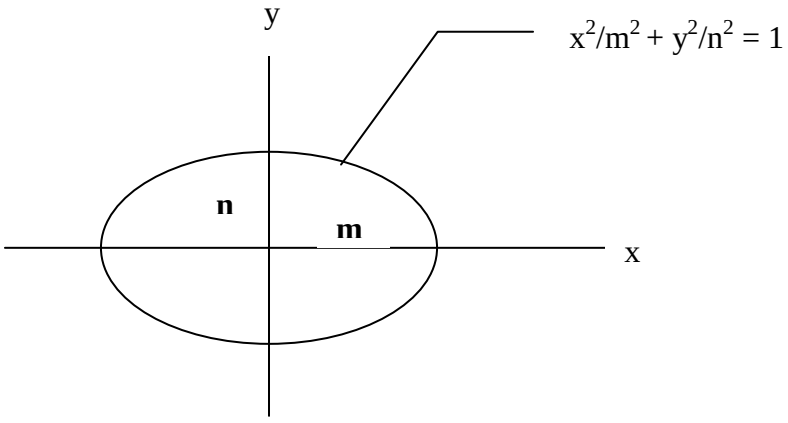

Figure 2 Equation of an ellipse

Therefore,

$$y^2 = n^2 (1 - x^2/m^2) \quad \text{…. Eq. 8b} \qquad \text{or} \qquad y = \pm n \sqrt{(1 - x^2/m^2)} \text{ …. Eq. 8c}$$

In order to take into consideration that there are no negative speed values (i.e. y values could only be positive), the above equation is shifted up by the value of the y-intercept (i.e. the value of n) to form:

$$y = n \pm n \sqrt{(1 - x^2/m^2)} \quad \ldots \text{Eq. 8d}$$

Equation 8d represents both stable and unstable conditions, as described in Table 1, for the one-regime linear speed-density relationship.

4.2 Two-regime linear speed-density relationship

A more realistic approach to the relationship between speed and density could take the form of a two- (or more) regime linear relationship representing both stable and unstable conditions. Figure 3 shows a two-regime linear relationship between speed and density which results in a non-symmetrical parabolic shape for the speed-flow relationship (as shown in Figure 4).

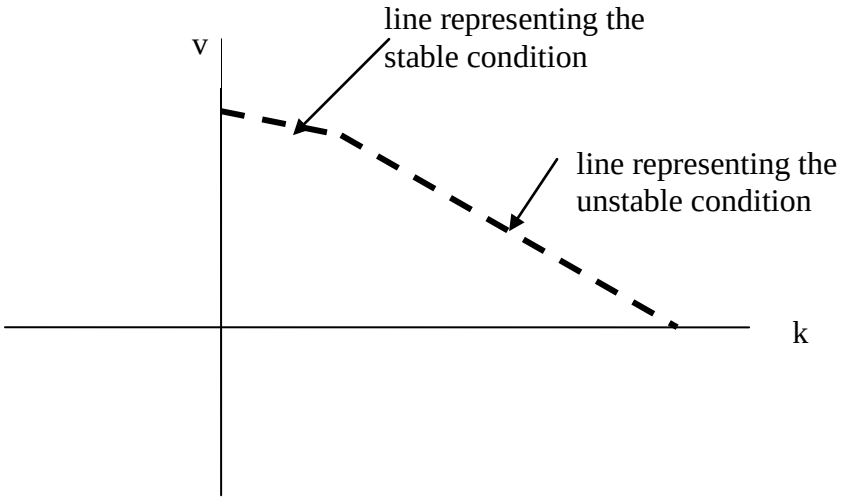

Figure 3 Two-regime linear for the speed-density relationship

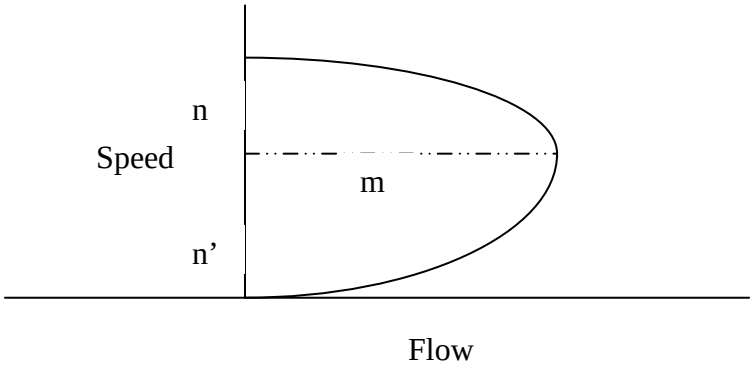

Figure 4 Speed-flow for the two-regime linear speed-density relationship

Making use of Equation 8c, and in order to take into consideration that there are no negative speed values for the speed-flow relationship (as discussed earlier), the equation is shifted up by n', as shown in Figure 4.

Therefore, Equation 8c, for the stable conditions, becomes:

$$y = n' + n\sqrt{(1 - x^2/m^2)} \ldots \text{Eq. 9a}$$

Similarly, for the unstable conditions:

$$y = n' - n'\sqrt{(1 - x^2/m^2)} \ldots \text{Eq. 9b}$$

In Figure 4, the intercept (m) takes only positive values representing capacity (q_{cap}), with (n) is represented by the difference between the free-flow speed (v_{free}) and optimum speed (v_{cap}), while (n') represents the optimum speed (v_{cap}) at capacity. This representation is more realistic than the previously described symmetrical form since it clearly differentiates between the stable (i.e. before capacity is reached) and the unstable traffic conditions (i.e. flows lower than capacity but with relatively low speeds and higher densities). In order to find the values of the intercepts used in these equations, published data from the Highway Capacity Manual (2000) were used.

5 Typical Values from the Highway Capacity Manual

For uninterrupted flow facilities, capacity (as described under level of service E) occurs where average density is in the region of 40 pc/mi/ln (or 25 pc/km/ln) with a maximum value of 45 pc/mi/ln as shown in Table 1. In Table 2 and according to Wright and Dixon (2004), for any known density, the maximum service flow rate (i.e. capacity, column 3) will increase for higher speed roadways (i.e. free-flow speed, column 1).

Fricker and Whitford (2004) stated that capacity varies by free-flow speed and that figures of about 2400 pc/hr/ln were used in design for most rural and suburban freeways with free-flow speed of 70 to 75 mph, whereas capacity values of 2250 pc/hr/ln corresponding to lower free-flow speeds of about 55 mph were often used in design of urban freeways.

Table 2 Typical maximum service flow rates for Level of Service E in pc/hr/ln for different free-flow speeds (Adapted from Wright and Dixon (2004))

	1	**2**	**3**	**4**	**5**
	Free-flow Speed (v_{free}) in mph *(km/hr)*	**Minimum Speed at Level of Service E (v_{cap}) in mph *(km/hr)***	**Maximum Service Flow Rate (q_{cap}) in pc/hr/ln**	**Speed intercept for stable conditions ($n=v_{free}-v_{cap}$) in mph (km/hr)**	**Speed intercept for unstable conditions ($n'=v_{cap}$) in mph (km/hr)**
rural	**75 *(120)***	**53.3 *(85.3)***	**2400**	21.7 (34.7)	53.3 *(85.3)*
↑	**70 *(112)***	**53.3 *(85.3)***	**2400**	16.7 (26.7)	53.3 *(85.3)*
↕	**65 *(104)***	**52.2 *(83.5)***	**2350**	12.8 (20.5)	52.2 *(83.5)*
↓	**60 *(96)***	**51.1 *(81.8)***	**2300**	8.9 (14.2)	51.1 *(81.8)*
urban	**55 *(88)***	**50.0 *(80.0)***	**2250**	5.0 (8.0)	50.0 *(80.0)*

The capacity values shown in Table 2 (column 3) are typical ones which may be adjusted depending on other factors, such as lane width, lateral clearance, traffic composition, type of drivers (e.g. commuters or unfamiliar users of the road), number of lanes, spacing between interchanges and general terrain.

Table 2 shows the constant values which could be used in formulating the equations representing both stable and unstable conditions of flow for different free-flow speeds

(e.g. representing different road types). This could easily be adjusted for use in modelling more realistic speed-flow relationships for different roadway conditions.

Fricker and Whitford (2004) stated that density is the primary determinant of the Level of Service and the speed criterion is the speed at maximum density for that Level. For a given LOS at capacity (i.e. LOS E), the maximum density reached will determine the minimum speed of that level as shown in column 2, Table 2.

In order to find the intercepts, n and n', which were previously described in Equations 9a and 9b, columns 4 and 5 in Table 2 were formed. Column 4 represents the speed intercept (n) in the stable condition and is formed by deducting column 2 from column 1, while column 5 representing the speed intercept for the unstable condition (n') is taken from column 2, since

$$v_{free} = n + n' , \quad v_{cap} = n' , \text{ and } \quad q_{cap} = m$$

Therefore,

$$v = v_{cap} + [(v_{free} - v_{cap}) \sqrt{(1 - (q^2 / q_{cap}^2))}] \quad \text{Eq. 10a (stable condition)}$$

$$v = v_{cap} - [(v_{cap}) \sqrt{(1 - (q^2 / q_{cap}^2))}] \quad \text{Eq. 10b (unstable condition)}$$

The values of these parameters could be obtained from the Highway Capacity Manual (2000) (as shown in Table 2 based on analytical studies for different types of roadway conditions). The above two equations are recommended in practice for use in modelling traffic conditions ranging from free-flowing to stationary queuing. Also, they are recommended for use in Traffic Engineering text books when describing speed-flow-density relationships since they represent both stable and unstable conditions which are likely to occur on site.

6 Typical Values for Jam Density and Free-Flow Speed

Jam density (k_{jam}) could be obtained from Equation 6 as follows:

$$q_{cap} = k_{cap} v_{cap} = (0.5 k_{jam}) v_{cap} , \text{ therefore, } \quad k_{jam} = 2 q_{cap} / v_{cap} \quad \ldots . \text{ Eq. 11}$$

Using the values from the Highway Capacity Manual (2000) shown in columns 2 and 3 of Table 2 and Equation 11, the calculated jam density, k_{jam}, for all free-flow speed conditions (i.e. ranging between 55 and 75 mph representing urban to rural conditions, respectively), reveals a figure of about 90 pc/mi/ln (i.e. 56 pc/km/ln). This indicates that when stationary queues are formed, the effect of the type of road (i.e. urban to rural) is negligible and jam density is more or less unchanged.

Using the value of 90 pc/mi/ln or 56 pc/km/ln for jam density obtained from Equation 11 above, the calculated average distance headway (h_d) when stationary is in the region of 18 metres. Obviously the average distance headway could vary depending on traffic composition (affecting the factor used in converting different types of vehicles into equivalent passenger car units).

According to Wright and Dixon (2004), the lengths of some articulated transit buses and semi-trailers are in excess of 60 ft (18.3 m). The higher the number of long vehicles in the traffic stream (such as buses and trucks), the lower is the jam density measured in veh/mi/ln (or veh/km/ln). Thus, the calculated average distance headway (h_d) of 18 metres when stationary is relatively high and some text books (e.g. Fricker and Whitford (2004) and Salter 1986) refer to a more realistic values in the region of 8 metres which corresponds to a jam density of 125 pc/km/ln (equivalent to 200 pc/mi/ln). Leutzbach (1988) suggested a higher figure for jam density of 150 veh/km/ln (i.e. 240 veh/mi/ln) as a rough guideline based on European studies. This results in relatively lower equivalent distance headway (h_d) of 6.7 meters.

Figure 5 shows the flow-density relationship for the two-regime linear speed-density relationship suggested in this paper based on distance headway (h_d) of 8 meters and those obtained from the Highway Capacity Manual (2000). The assumption used in Equation 4 for calculating the optimum density at capacity should therefore be adapted as follows:

$k_{cap} = 0.50\ k_{jam}$ ….. Eq. 12a (based on a maximum density of 45 pc/mi/ln or 28 pc/km/ln as used by the Highway Capacity Manual (2000))

and

$k_{cap} = 0.20\ k_{jam}$ ….. Eq. 12b (based on h_d of 8 meters when stationary)

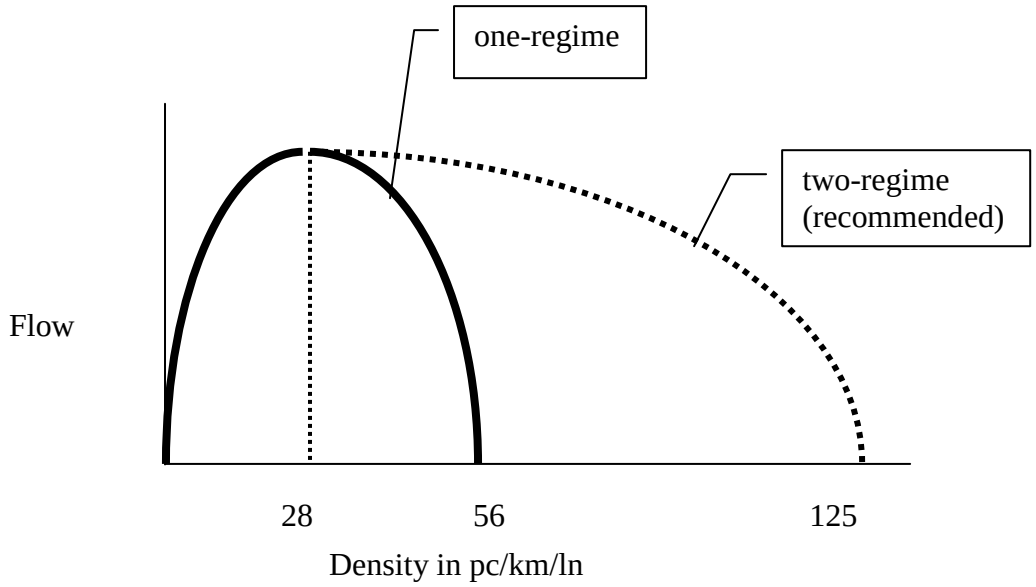

Figure 5 Flow-density relationship for the two-regime linear speed-density relationship

Similarly, one could obtain the relationship between free-flow speed (v_{free}) and speed at capacity (v_{cap}) for different roadway conditions (i.e. rural to urban) using columns 1 and 2 in Table 2 from the Highway Capacity Manual (2000). This will result in v_{free} values ranging between 1.10 and 1.41 times v_{cap} for urban to rural freeways, respectively.

7 Conclusions

The assumption that speed-density relationship is linear is widely used due to its simplistic representation of the behaviour of traffic. A more realistic approach to speed-density models is to use the two-regime linear form to take into account the effect of stable and unstable conditions. This relationship gives a non-symmetrical partial elliptical shape for the speed-flow relationship as shown in Equations 10a and 10b. These equations are recommended for use in relevant Traffic Engineering text books when describing speed-flow-density relationships since they give better representation of traffic behaviour for stable and unstable conditions.

Maximum density of 45 pc/mi/ln (i.e. 28 pc/km/ln) could be used as the boundary value for the stable traffic condition. Jam density values calculated from the Highway Capacity Manual (2000) are in the region of 90 pc/mi/ln (i.e. 56 pc/km/ln). This yields average distance headways of 18 meters when dealing with stationary queues which is relatively high. However, it is more realistic to obtain jam density in the region of 200 pc/mi/ln (i.e. 125 pc/km/ln) which are nearly double those figures obtained from the Highway Capacity Manual (2000). The parameters used for the proposed partial elliptical model could be tested and validated using data from various sites operating under free, medium and congested traffic conditions.

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Ontology-driven learning object repository on the Semantic Web

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Abstract:
The development of learning objects which are smaller chunks of learning content is often time consuming and expensive. Recent efforts in producing learning objects that are reusable and sharable were not very successful due to the lack of interoperability between different learning systems and applications. On the other hand, Semantic Web technologies together with ontologies provide rich medium for facilitating e-learning via the semantic annotated learning objects and shared repositories. However, Semantic Web technologies have not yet been applied widely to deliver learning objects and support e-learning. In this paper, we demonstrate how the ontologies and Semantic Web technologies provide a solution to overcome the problems with interoperability among e-learning environments. This paper provides a conceptual framework that provided the basics for the development of ontology-driven learning objects repository on the Semantic Web. The paper also outlines the development of repository using the ontology-driven Semantic Web approach. The developed learning object repository has been evaluated with users for usability, functionality and acceptability. The repository scored high in usability and functionality testing; however acceptability of the system is low in the academic setting.

Keywords:
E-Learning, Learning Objects, Learning Objects Repository, Ontology, Semantic Web

1 Introduction

In the last decade, learning objects, which are smaller chunks of learning contents, have gained a lot of interest as the basis of a new type of computer-based instruction in which the instructional content is created from individual components. The concept of learning object has evolved from the need to reuse digital learning materials. Learning objects offer economic as well as pedagogical advantages over the traditional learning materials. The learning objects are created just once, but used several times in different contexts, compensating the high cost of production. Also, high quality, thoughtfully designed, multimedia learning objects could be easily accessed by any instructor or learner. This object-based principle is based upon the idea that a course or lesson can be built from reusable instructional components which can be built separately but modified

to the user's needs. A learning object is a self-contained component with associated metadata that allow to reuse the object in different contexts. Additionally, learning objects are generally understood to be digital entities deliverable over the internet, making them accessible and usable by multiple users in parallel (Wiley, 2001).
Learning object metadata are a schema used for describing learning objects. IEEE LOM is one of the standards exists for describing learning objects (LOM, 2003). Although the IEEE LOM standard has led to a wide adoption of learning objects metadata, learning objects still suffer from the difficulty to create metadata. As a result, some issues are identified which are given below:

- Most reuse initiatives still struggle to achieve a critical mass of learning objects to really establish reuse,
- Many learning objects only have a very limited set of metadata associated to them (Najjar *et al.*, 2003; Najjar *et al.*, 2004),
- Metadata are added only once and remain unchanged afterwards, during the further life of the learning object.

This research applies Semantic Web technologies and ontologies to address the issues mentioned above. Therefore, aim of the research is to develop an environment for learning objects that are interoperable, transparent and sharable by the community of educators and learners within the construction discipline. This paper first describes conceptual framework, followed by research methodology, design and development and evaluation of the developed system. Next section describes the conceptual framework that addresses the challenges faced by the development of learning objects and the enablers that facilitates the development of online environment.

2 Conceptual Framework

The three main challenges that are faced by the development of learning objects are:

- Intelligent by developing semantic metadata,
- Sharable through content packaging and
- Dynamic using ontologies and Semantic Web.

Figure 1 shows the conceptual framework that is produced as part of the research to develop an online environment of learning objects.

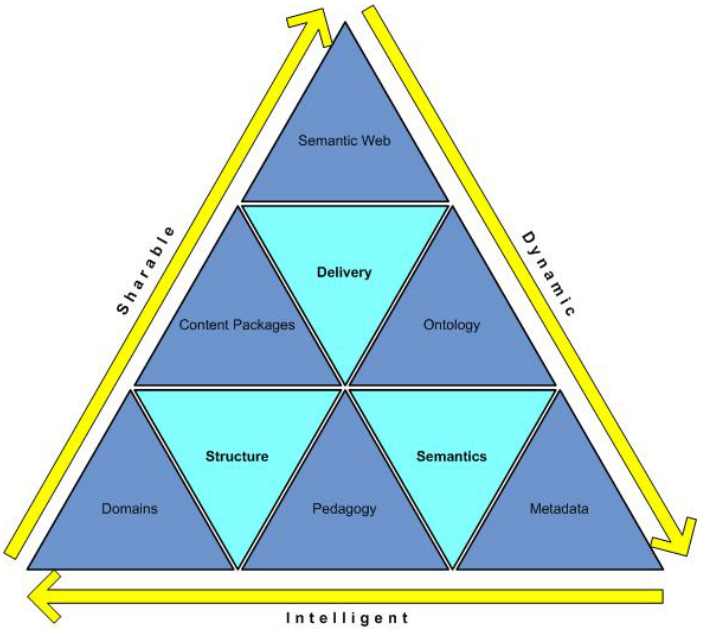

Figure 1: Conceptual Framework

To meet these challenges the following methodological steps are followed to design and develop the online environment:

- Stage 1: To develop a metadata framework which integrates pedagogical and construction metadata that can be applied to a variety of learning objects.
- Stage 2: To apply a content packaging standard that packages learning objects together in order to export to and retrieve from various learning management systems.
- Stage 3: To identify the ontology (i.e. a common vocabulary of terms and concepts) for construction education and to develop a Semantic Web environment that will increase sharability of objects within construction domain.

This research adapted UKLOM metadata standard for developing learning objects fror construction (UKLOM, 2004). Next section outlines the research methodology adapted to follow the methodological steps mentioned above.

3 Methodology

The research reported in the paper has a design science intent, one that acknowledges IT as a component of improving and developing artefacts for the development of better solutions and tools. The research approach leverages design science research and follows the general design cycle described by Vaishnavi and Kuechler (2004). In this model, all design begins with Awareness of a Problem. Design science research is sometimes called “improvement research,” and this designation emphasises the problem-solving or performance-improving nature of the activity. An attempt at implementing an artifact according to the suggested solution is Development. Partially or fully successful implementations are then evaluated according to the functional specification implicit or explicit in the suggestion. Development, Evaluation, and

further Suggestions are often iteratively performed in the course of the design research. The basis of the iteration, the flow from partial completion of the cycle back to Awareness of Problem, is indicated by the Circumscription arrow. Conclusion indicates termination of a specific design project. The Design Science Cycle is shown in Figure 2.

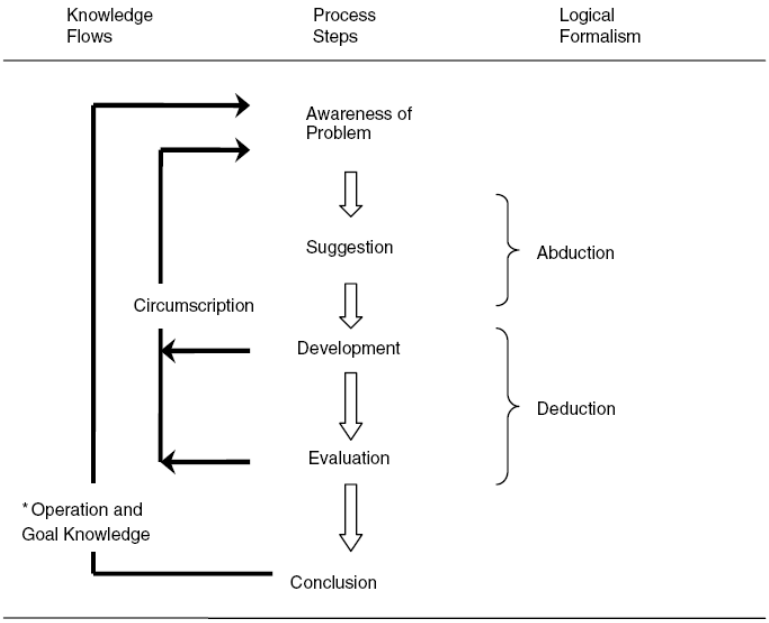

Figure 2: General Design Cycle (Takeda et al. (1990))

3.1 Awareness of Problem

The first step of the Design Science Cycle is an awareness of a problem through problem identification and definition. The problem identified in the current research is the difficulty in reusing and sharing learning content among educators, learners and curriculum developers. The research developed a framework as shown in Figure 1 that addresses the challenging of developing sharable learning objects.

3.2 Suggestion

To examine the research question of how to reuse and share the learning objects among educators and learners, it is important to gain an understanding of the current usage of the learning content and the technologies that enable reusability and sharability. According to the conceptual framework, Semantic Web technologies together with the ontologies provide a solution to enable the development of dynamic environment. A literature review is conducted to see how intelligent and dynamic learning objects can be developed. Metadata standards provide the label for learning objects that enhance the discovery of learning objects. Content packages provide the ability to package the relevant learning objects together in order to export to the learning management systems like Blackboard.

3.3 Development

The literature review of learning objects, educational standards and web technologies provides a suggestion to address the research problem of reusability and sharability of learning objects. With the knowledge gained in the first two steps, the next step is to utilise it for implementing the suggestion as discussed in the Suggestion phase. This phase is where most of the actual design takes place, which is the creative effort required in synthesising existing knowledge and a well-defined problem definition into an artifact for solving the problem. A resulting artifact of design science research may be rather abstract in nature, such as in the form of constructs, models, or methods (March and Smith, 1995). However, the research reported in the paper has developed a full-working prototype of repository.

3.4 Evaluation

After the development of an artifact, it is necessary to evaluate the artifact using empirical methods "to determine how well an artifact works" (Hevner et al., 2004). There are multiple evaluation options, including action research, controlled experiments, simulation, or scenarios (Vaishnavi, 2004). According to Whitley (1996), experimentation has the high internal validity and control and therefore it has been chosen as a research methodology for the Evaluation phase. Experiments in terms of testing the functionality, usability and user acceptability are used to evaluate the learning objects repository. Functional (black-box) and structural (white-box) tests are carried out to check the systems for any failures in execution of any commands during the software testing.

3.5 Conclusion

Conclusion is drawn from the findings from the evaluation stage. Future research is also identified and discussed in this final stage. Next section describes the design and development of the learning objects repository.

4 Design and Development

4.1 Ontology Concepts and Classes

According to Gruber (1993), ontology is an explicit specification of a conceptualisation. According to Noy and McGuinness (2001), ontologies are developed in order to:

- share common understanding of the structure of information among people or software agents
- enable reuse of domain knowledge
- make domain assumptions explicit
- separate domain knowledge from the operational knowledge and
- analyse domain knowledge

This research has developed ontology for sharing learning objects in construction. Figure 3 outlines the concepts and classes in the ontology including, structure, disciplines, learning objects types and pedagogy. The programme structure including modules, topics have been modelling in the construction education ontology.

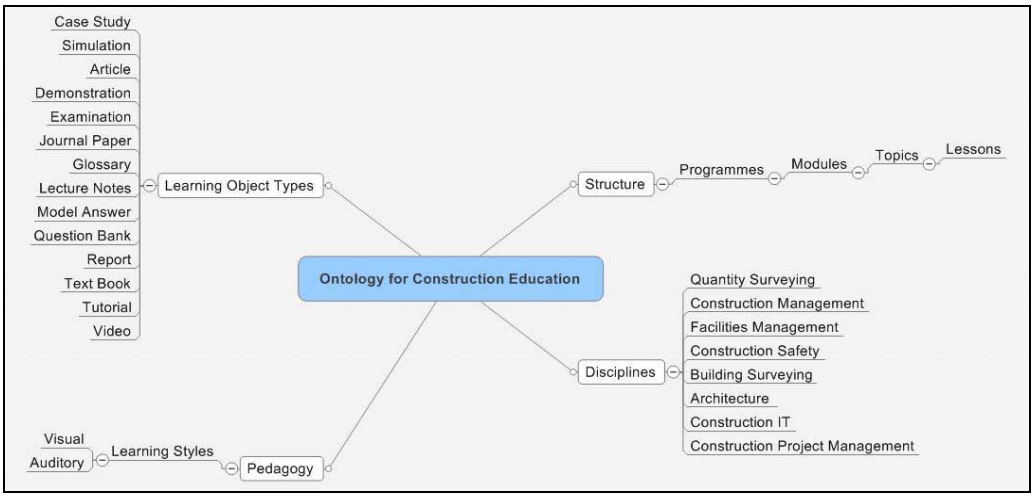

Figure 3: Classes in the Ontology for Construction Education

4.2 Design of Learning Objects Repository

The learning objects repository is developed as an iterative development process. A use case diagram is a type of behavioural diagram defined by the Unified Modelling Language (UML) (UML Wikipedia, 2008). Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases (Use Case Wikipedia, 2008). Use case diagram is used to design the functionalities of the learning objects repository. Figure 4 shows the use case diagram designed as part of this research to develop the learning objects repository. Unregistered users will have limited access to the learning objects repository compared to registered users.

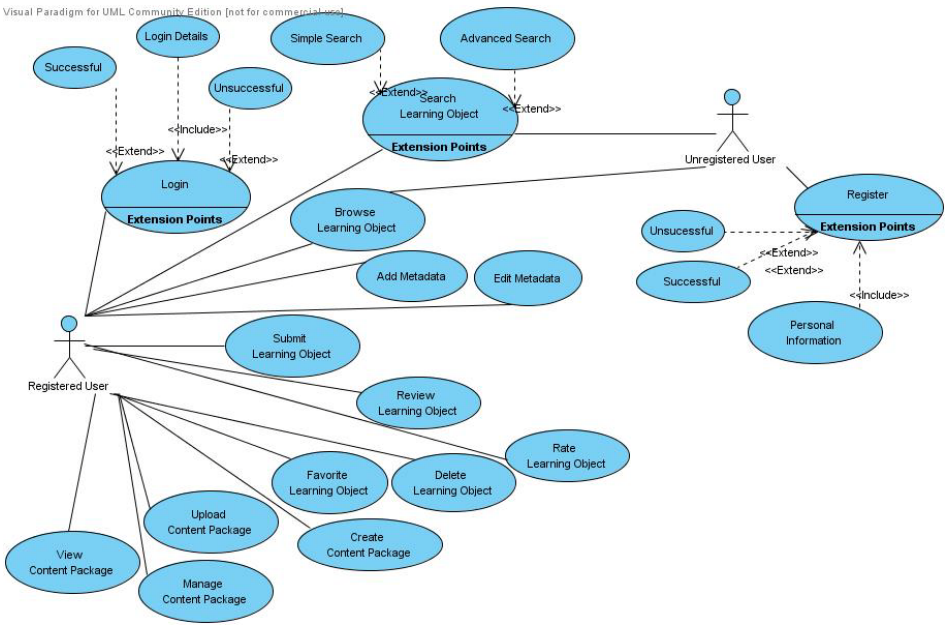

Figure 4: Use Case Diagram of the Learning Objects Repository

4.3 Development of the Learning Objects Repository

The repository is built using open source software and tools. The core of the system is the Semantic Web toolkit called Jena. Jena is a Java framework for building Semantic Web applications. It provides a programmatic environment for RDF, RDFS and OWL, SPARQL and includes a rule-based inference engine. The repository has two separate systems that work together to function as a repository. The learning objects system is built using Semantic Web technologies and ontologies. The system is to manage content packages is built using SCORM content packaging standard and PHP. Figure 5 presents the architecture framework of the Semantic Web based Learning Objects Repository.

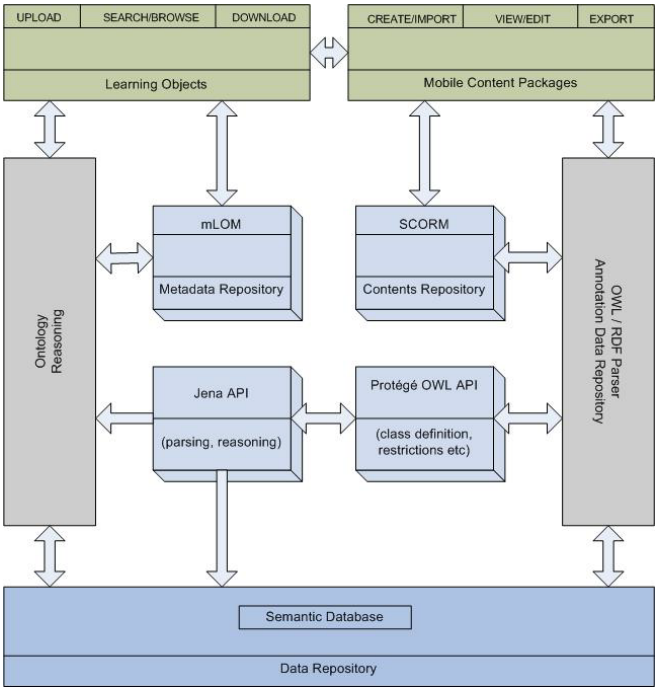

Figure 5: Architecture Framework of the Repository

Learning objects can be uploaded, browsed and searched within the repository. Similarly, within the repository content packages can be created using learning objects, uploaded to the repository in a zip format and exported to the learning management systems such as Blackboard. Figure 6 shows how the learning objects and its metadata are stored in the semantic database. Information are stored as RDF (Resource Description Framework) with three elements i.e. subjects, properties and objects.

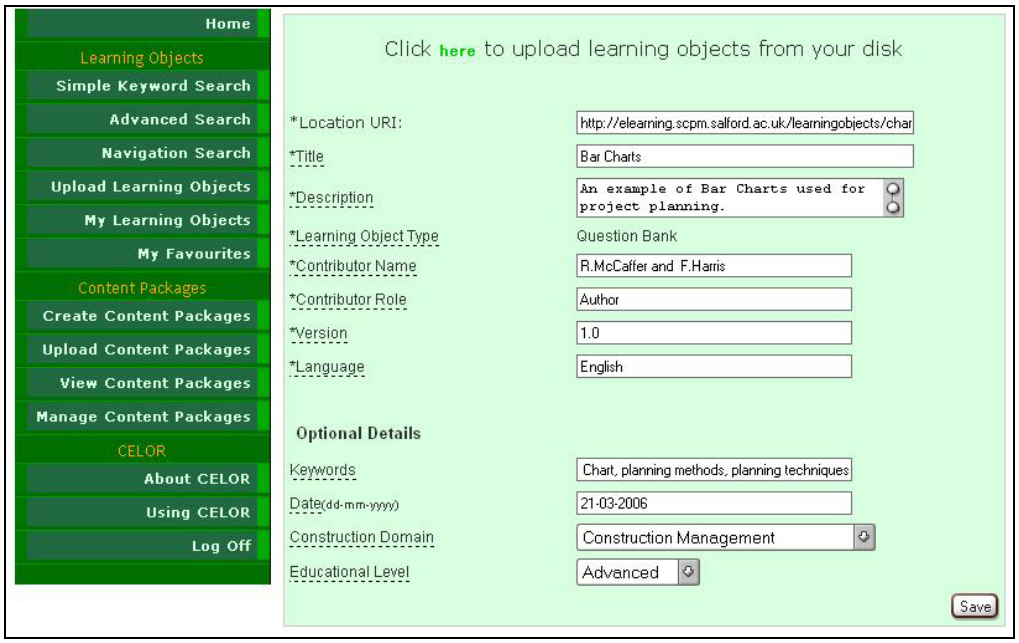

Figure 6: Learning Objects Repository

5 Evaluation

Usability tests are carried out in order to test the systems for the fitness to their purpose (effective, efficient and satisfying) in the context of use (user, tasks, socio-technical environment). In order to carry out a usability test, a small sample of users is selected from user group. A set of tasks based on the scenarios is carried out by the user being watched by the evaluator (Rubin, 1994). Role of the evaluator is to brief the user and to annotate time, number of errors and completion percentage for each task. At the end of the test the users are handed a psychometric questionnaire – in order to cross check the perceived usability and satisfaction with the performance data. Brooke's (1996) System Usability Scale (SUS) questionnaire is used to evaluate the usability of the learning object repository as it is relatively short, however it is proved to be more effective than their longer counterparts such as Questionnaire for User Interface Satisfaction (QUIS) and Computer System Usability Questionnaire (CSUQ) (Tullis and Stetson, 2004).

The SUS scale is used after the respondent has had an opportunity to use the system, but before any discussion takes place. Respondents have been asked to record their immediate response to each item, rather than thinking about items for a long time. Respondents have also been asked to check all the items and if a respondent feels that they cannot respond to a particular item, they should mark the centre point of the scale. Evaluator is briefed the respondents with the purpose of the learning object repository and then a set of tasks are given to them to perform with the system. A set of tasks that have given to respondents is given below.

Task 1: Submit a learning object

Task 2: Search for a learning object, which consists of

- Simple search
- Advanced search
- Browse search

Task 3: Create a content package

The usability test is set to measure three aspects such as effectiveness, efficiency, and satisfaction.

- Effectiveness: a task is completed successfully
- Efficiency: the time taken to achieve a goal
- Satisfaction: the results of questionnaires

In order to measure the efficiency, the time taken to achieve a goal is measured from the time the user is asked to start, to the time the goal has been achieved. The expected time to complete the task has been estimated from pre-tests. According to Bevan (2007), the maximum time allowed to users before they are categorised as having failed should be at least three times the expected time. Table 1 outlines the allocated time in minutes for each task with the expected time.

Table 1: Allocated time for tasks

Tasks	Expected time	Allocated time
Submit a learning object	3	9
Search for a learning object	4	12
Create a content package	3	9

Each task is allocated a maximum amount of time to achieve its aim. Responses have been recorded and analysed. The next section reports the analysis of data obtained from the questionnaires using different methods.

5.1 Method 1 – Total Score

Usability testing using SUS is carried out with 14 users to test the satisfaction of the users in using the learning objects repository. The SUS score is calculated by summing up the score contributions from each item. Each item's score contribution ranges from 0 to 4. For items 1, 3, 5, 7, and 9 in the SUS, the score contribution is the scale position minus 1. For items 2, 4, 6, 8 and 10, the contribution is 5 minus the scale position. Total SUS score is obtained by multiplying the sum of the scores by 2.5 to obtain the overall value of SUS. SUS score has a range of 0 to 100 which represents a composite measure of the overall usability of the system being studied, in this case learning objects repository. Figure 7 shows the results of the usability tests with total 14 users. All the questionnaires score above the 85% with 1 tests scored 100%. The figures show that high satisfaction of using the learning objects repository among the respondents.

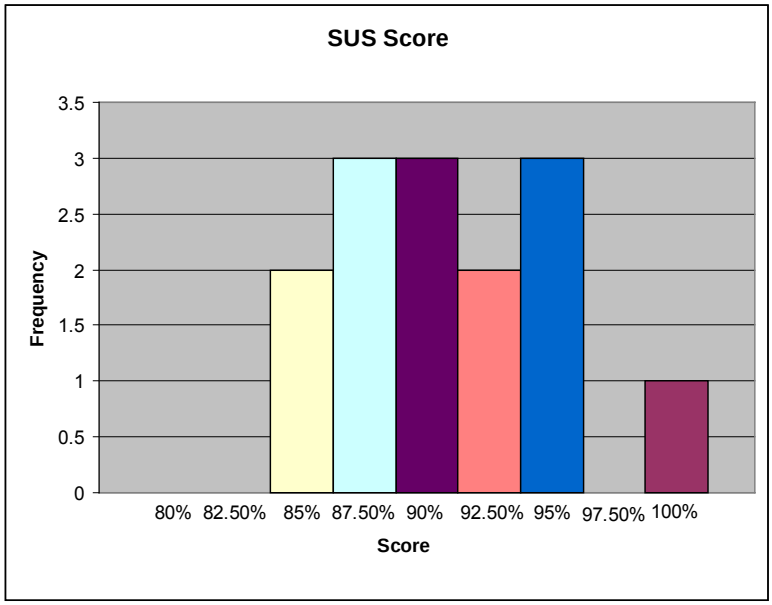

Figure 7: Usability Test SUS Score

5.2 Method 2 – Maximum Rating

Questionnaires were converted to percentages by dividing each score by the maximum score possible on that scale. So, for example, a rating of 3 on SUS was converted to a percentage by dividing that by 5 (the maximum score for SUS), giving a percentage of 60%. The frequency distributions of the ratings on each questionnaire is converted to percentages as described above, are shown in Figure 8. The higher frequencies of maximum rating in the SUS responses indicate that users satisfy with the learning objects repository, its interface and functionalities.

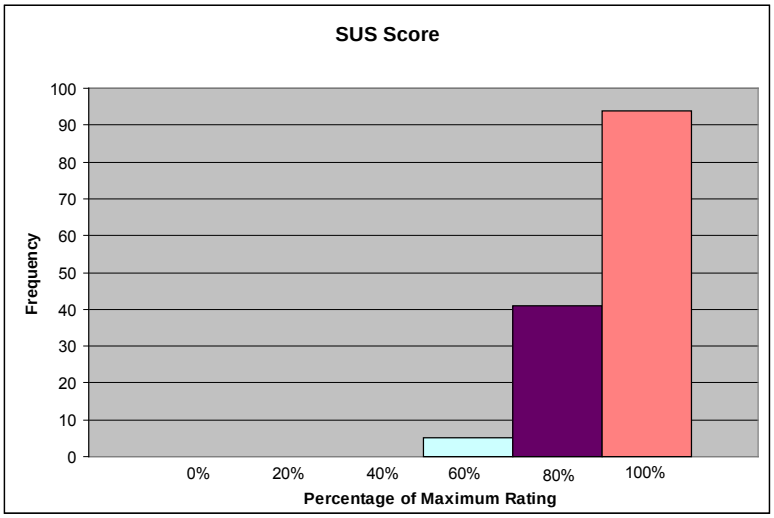

Figure 8: Maximum Rating in SUS questionnaire

5.3 Method 3 – Goal Achievement

SUS questionnaire respondents are allocated a maximum amount of time for successful goal achievement for each task as set out in criteria in Table 1. Figure 9 shows the goal achievement of the respondents.

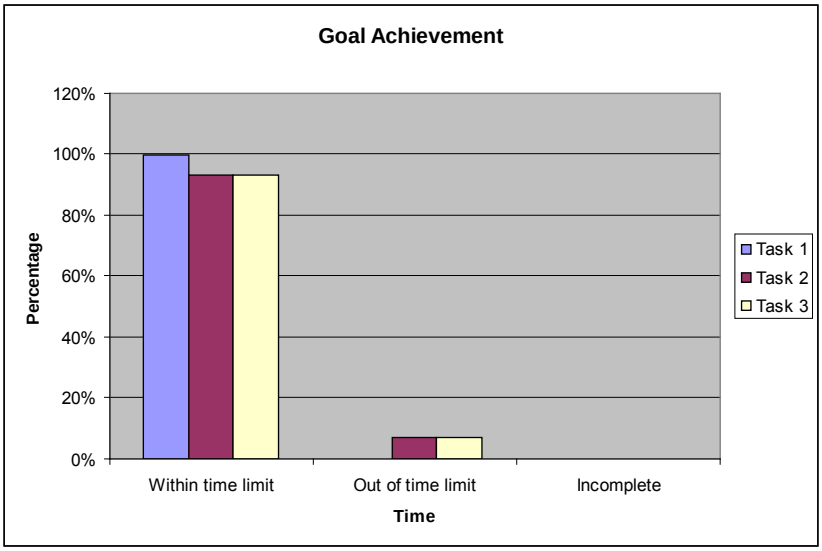

Figure 9: Goal Achievement by Time

All the users have completed Task 1 successfully within the allocated time. 93% of the users have completed Task 2 and 3 within the allocated time. Only 7% of the users have completed the Task 2 & 3 out of the allocated time. It shows that high efficiency of the learning object repository in terms of its usage and functionalities. In addition to that, all the users have completed the tasks in the usability tests. It demonstrates that 100% effectiveness of the learning object repository.

6 Conclusion

This research proposed a conceptual framework for developing dynamic, intelligent and sharable learning objects. The framework brought enabling standards and technologies together to develop a dynamic learning object repository. The framework is tested by developing a prototype learning object repository for construction. Metadata standard offered semantic annotation for learning objects and thus enhanced the discoverability and reusability of learning objects. UKLOM is adapted to develop the learning object repository as it provided the context of the UK education. There is no metadata for construction learning objects exist, and therefore this research proposed a metadata framework for construction by integrating construction domain as an element to UKLOM standard. The literature review revealed that no ontology for construction education exists. Therefore this research identified relevant pedagogical elements for learning objects which have been developed as classes for construction education ontology. The developed ontology demonstrated the application of ontology for sharable learning objects, however if the ontology is developed with more concepts, it can make huge contributions to develop lot more sharable and intelligent learning objects. An innovative approach has been adapted to develop the learning object repository using ontologies on the Semantic Web. Semantic Web is emerging as a next-

generation Web and has huge potential for developing intelligent learning objects and supporting e-learning at large. Semantic Web and ontologies offer great educational value to curriculum developers and users who are desperate for change in the way traditional e-learning tools and applications work. The developed learning object repository has been evaluated with users for usability, functionality and acceptability and to see if it satisfies the pedagogical needs of the users. The repository scored high in usability and functionality testing; however acceptability of such system is low in the academic setting due to several reasons. Academic institutions should encourage the use of various e-learning tools rather concentrating on a particular learning management system (e.g. Blackboard) and also recognise the successful implementation of such tools in the academic settings.

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Role and Importance of Online Communities in Academic Life: An Empirical Study

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Abstract:
Online Communities such as Virtual Communities of Practice (VCoPs) have been considered as learning platforms in current advanced digital coding environment. Users are accepting it as the powerful tool of the twenty-first century for instant solution of their unsolved problems. Online Communities are usually topic based and initiate discussions between topic experts and students. This paper is an attempt to see the role and importance of Online Communities in the academic life of students. This Paper also determines the significant difference of use of Online Communities between undergraduate and postgraduate students in the United Arab Emirates (UAE). Such significant differences are highlighted with respect to the learning environment, motivation, personal gain and other criterion. A comparative analysis has been done to see the use of virtual communities in the same domains which definitely help us to determine the role and importance of such Online Communities in the Academic Life of a student in this part of the world. In conclusion the key factors influencing success of virtual communities among students are identified.

Keywords:
Communities of Practice, Online Communities, Virtual Communities of Practice

1 Introduction

The higher education provided by colleges, technical institutions and universities in the United Arab Emirates (UAE) is blend of Educational systems around the world. In addition to the local UAE Universities, other universities from different countries like United States of America (USA), United Kingdom (UK), India, Pakistan and Australia have established their offshore campuses in various emirates of the UAE such as Dubai, Sharjah, Ras-Al-Khaimah etc. These Universities offer a wide range of academic programs to graduate and undergraduate students, with highly diverse methodology,

curriculum, advance technology, training programs, academic facility etc. Books have an important role in the academic life of students as they provide a better understanding of the subject. However the availability of books is a major issue in the UAE.

Therefore, there is an enormous role of Online Communities to play as a learning platform for student community. Interested Students join such Online Communities and share their knowledge, queries, problems and academic issues with other members, who may be students or experts but dispersed geographically across the globe. Several researchers have pointed out that students are successfully finding solutions to their problems by participating in Online Communities (Hafeez and Alghatas, 2007; Dettling and Schubert, 2002).

2 Literature Review

2.1 Online Communities

It was 1979, when the first Usenet news sharing programs were created (Ling *et al.*, 2004) and after 29 years, people started sharing news, information, jokes, music, discussion, pictures, and social support in hundreds of thousands of online communities. Pioneers of online community research (Rheingold, 1993) used the term 'online community' to connote the intense feelings of camaraderie, empathy and support among people in the online spaces. Other researchers (De Souza and Preece, 2004; Preece and Maloney-Krichmar, 2005) contributed to the analysis, design, and evaluation of community software platforms.

Dating back to the mid 1990s, use of online communities was very limited and was not available to everyone but now it is increasing very fast. It is increasingly common for online communities to rely on members rather than editors to contribute and moderate content (Harper *et al.*, 2007). To motivate members to perform these tasks, some sites display social comparisons, information designed to show members how they compare with others in the system.

2.2 Communities of Practice (CoPs)

Wenger (2000) defined CoPs as “Communities of Practice are groups of people who share concern or a passion for something they do and learn how to do it better as they interact regularly”. The members of a CoP need not be from the same discipline; in fact the Community can be strengthened and invigorated by drawing the expertise of its various members (Borrego *et al.*, 2006). Gheradi and Neolini (2000) concluded that the key feature of any CoP is the community knowledge accumulated through the practice in CoP is more than the sum of individual knowledge of members of the same.

2.3 Virtual Communities of Practice (VCoPs)

Kimble and Barlow (2000) define a virtual team as a "micro-level" form of geographically dispersed workers using Information and Communications Technologies (ICTs). Johnson (2001) suggests that traditional communities are situation specific; Virtual Communities are task centered, and they are formed as and when the need arises. A VCoP may use a large array of traditional media like phone, teleconference, fax etc, and more of less sophisticated technological tools such as e – mail, videoconferencing, newsgroup, online meeting space, common database, website or intranet to establish a common virtual collaborative space. (Dube *et al.*, 2006). Pallof and Pratt (1999) have defined the formation of Community's purpose, establishing norms and code of conduct, and more importantly role of its members. (Johnson, 2001) suggests that current web-based and text-based environments are conducive in allowing VCoPs to form and operate as "learning entities".

Lattemann and Stieglitz (2005) suggested the key factors that lead to success or failure of Virtual Communities are community goals and objectives, time for community participation, management support in distribution of quality information and use of technologies that facilitate communications among VCoP members. Once a VCoP is formed, the people from various domain of expertise become its members. Many members join the VCoP to seek answers to their problems whereas others who are experts in their field contribute to the VCoPs by answering the questions posted by other members.

3 Objective, Motivation and Research Methodology

3.1 Objective

The research, so far conducted, has been focusing in all the areas except service sector specifically education sector and less emphasis have been given to academic institutions. Universities and higher education institutions are very good examples of communities and may be considered as an important source of information for analysing the performance of Online Communities. In the past, less research effort has been done in the area of role and importance of Online Communities in academic life.

The main objective of this paper is to see the role and significance of online communities from the perspective of the academic life of undergraduate and postgraduate students in UAE. It aims to verify the role and the impact of Online Communities such as virtual communities of practice on the education of students who are studying in different academic programs, offered by these universities in the United Arab Emirates (UAE). It is an attempt to explore the concept of Online Communities

and their impact on ‘student learning and skill development’ in the United Arab Emirates (UAE).

3.2 Motivation

The authors have conducted a detailed study of research on Online Communities in the academic sector. Some of the mentioned researches are briefly explained in the following paragraphs. The authors were positively motivated by these studies.

One particular research on Online Communities was carried out by McDowell *et al.* (2005) in the MIT Centre for Reflective Community Practice. The findings stated are - the integration of the type of knowledge that arises from research that is ‘formal’ and taught in academic institutions, with the type of knowledge that resides in the work and minds of practitioners, is critical for improving society because it brings two complementary views of the world; and this is critical for the formation and success of online communities (McDowell *et al.*, 2005). The above citation cannot be more applicable to anyone other than students, studying in any given academic program, in any part of the world.

While conducting research on Online Communities in Bradford University (United Kingdom), Hafeez and Alghatas (2007), examined a number of Knowledge Management tools such as story telling and discourse analysis to illustrate how knowledge is transferred and learning takes place in a Virtual Community of Practice.

Dettling *et al.* (2002) conducted a study on the Online Community “vicos” set in Switzerland. "vicos” consists of different interest groups in and around SWISS University of Applied Sciences (UAS). “vicos” is a hybrid form of community : it combines aspects of a learning community as well as of a business community. The main goal is to exchange information which supports the students in their effort to successfully finish their studies (Learning Community). The “vicos” members also show as confirmed by empirical studies, a great interest in business aspects like selling their theses, finding a good job, career planning (The Business Community).

3.3 Research Methodology

Scientific research is more than fact finding, census or mere documentation of records. It is purposeful fact gathering, data analysis, and then its dynamic interpretation. Statistical theories are the mechanisms and the container of knowledge while moving from the unknown world to the known destination. Varieties of research methods are available for conducting an experimental investigation. One of these is the survey method. For the present research the questionnaire methodology was selected and an inventory system for this purpose was utilized.

Just prior to the commencement of the study, role and importance of online communities in academic life of student, the inventory system was prepared. It comprised of nine questions divided into six specific variables related to online communities. An inventory system was designed to assess the readiness of students for using online communities. The questionnaire was based on the dimensions - Problem Solving Method, Learning Environment, Primary Motive to join Online Community, Personal Gain, Importance of Online Communities and Authenticity of Information in Online Communities; which are critical to project the success of online communities in the near future.

For this study, all the explored disciplines; were selected from Manipal University – Dubai Campus, located in UAE. In this study six academic programs viz – MBA, MSc (Biotechnology), BSc (Information Technology), BBA, BA (Interior Design) and BA (Media and Communications) were investigated for the research. All the data were collected from the same university in light of the designed questionnaire, and were analyzed according to prior planning with an attempt to reach the highest level of accuracy and validity.

4 Findings and Discussion

4.1 Findings

This research paper employed questionnaire as the primary data collection tool.
After the data collection through questionnaire, the following table was prepared:

Table 1. Tabulation of Questionnaire Data (in Percentage)

Indicators	Indicator Choice	Postgraduate Students (Data in %)			Undergraduate Students (Data in %)				
		MBA	MSc (BioTech)	PG Average	BSc (IT)	BBA	BA (Interior Design)	BA (Media)	UG Average
Problem Solving Method	Ask Questions to Faculty	40	61	51	76	60	65	72	68
	Search online resources	95	83	89	95	65	70	78	77
	Books/ Journals	45	67	56	33	85	50	50	55
	Virtual Communities	45	11	28	29	10	15	28	20
Learning Environment	Classroom Teaching	75	72	74	76	80	75	61	73
	Library Reading	20	39	29	19	45	20	44	32
	Virtual Community Discussions	30	0	15	43	0	10	22	19
	Group Study/ Discussions	85	72	79	71	85	70	61	72
Primary Motive to join Online Community	To solve problem	75	6	40	57	35	45	39	44
	Learn from discussions	60	11	36	71	45	55	50	55
	Casual Surfing	35	83	59	38	45	50	28	40
Personal Gain	Knowledge	90	28	59	95	50	55	72	68
	Problem Solution	75	0	38	57	35	35	44	43
	Help Solve others' Problems	45	11	28	38	25	25	22	28
	Social Networking	35	39	37	48	75	75	44	61
Why Online Communities are important?	Non-availability of books	60	33	47	24	15	20	28	22
	Books are not enough to solve problems	55	56	55	33	40	40	28	35
	Online Communities are fast in getting solutions	70	17	43	67	25	45	33	43
	Online communities	40	22	31	67	30	20	39	39

	provide innovative approach to solutions								
	Online communities are easy to access and use	50	39	44	62	40	65	61	57
	Online Communities facilitate social networking	40	11	26	48	60	50	44	51
Feedback about the authenticity	Extremely Authentic	10	0	5	10	0	5	0	4
	Fairly Authentic	75	22	49	62	45	45	39	48
	Sometimes Authentic	10	50	30	24	0	30	44	25
	Rarely Authentic	0	0	0	5	0	0	6	3
	Cannot say	5	17	11	0	0	20	11	8

Statistical graphs were plotted from the above data in two ways; firstly individual graphs were constructed for each of the indicators. The data were categorized with respect to Academic Programs viz MBA (Master of Business Administration), MSc (Biotechnology), BSc (Information Technology), BBA (Bachelor of Business Administration), BA (Interior Design) and BA (Media and Communications). The graphs thus generated are as follows:

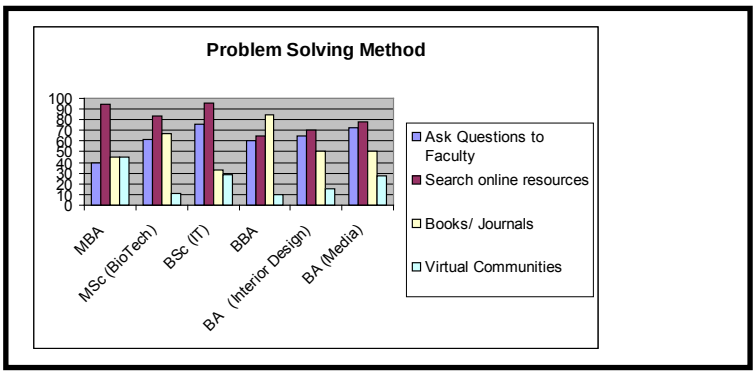

Figure 1. Graph for Indicator "Problem solving method"

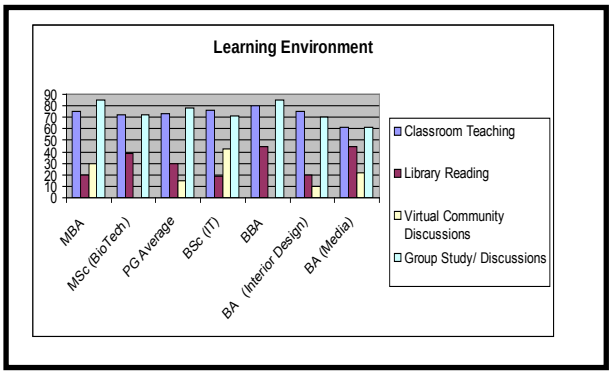

Figure 2. Graph for Indicator "Learning Environment"

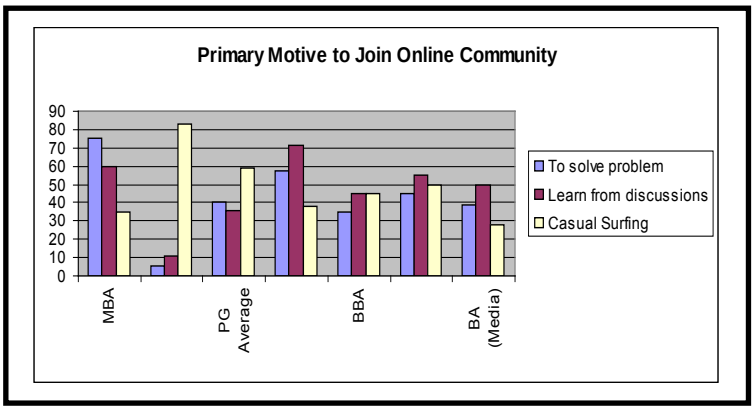

Figure 3. Graph for Indicator "Primary Motive"

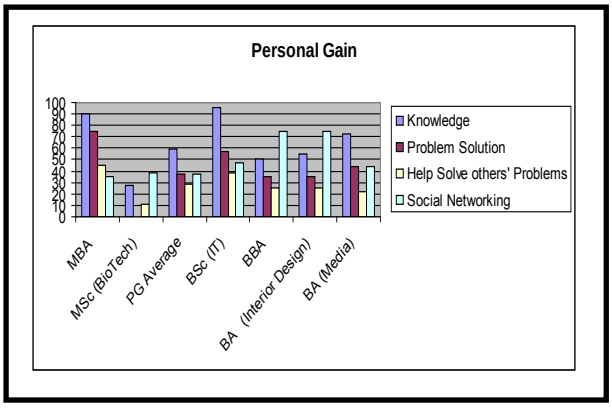

Figure 4. Graph for Indicator "Personal Gain"

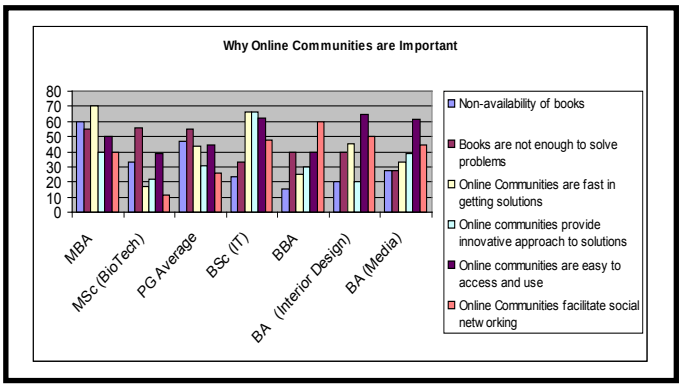

Figure 5. Graph for Indicator "Importance of Online Communities"

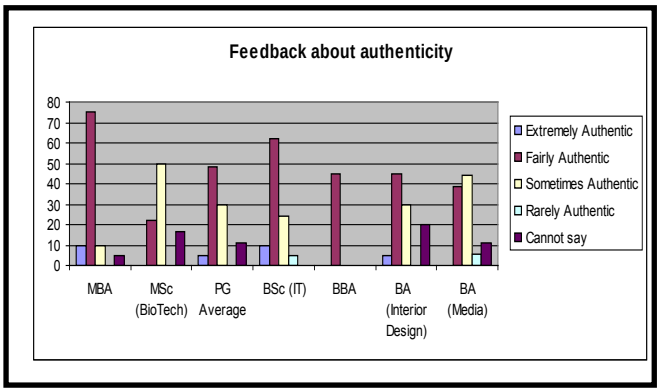

Figure 6. Graph for Indicator "Feedback on authenticity"

Secondly individual graphs were constructed for each of the discussed indicator given below – (Undergraduate Students and Post Graduate Students)
The graphs thus generated are as follows:

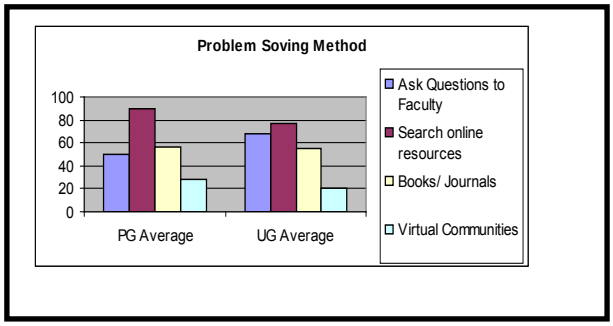

Figure 7. Graph for Indicator "Problem solving method"

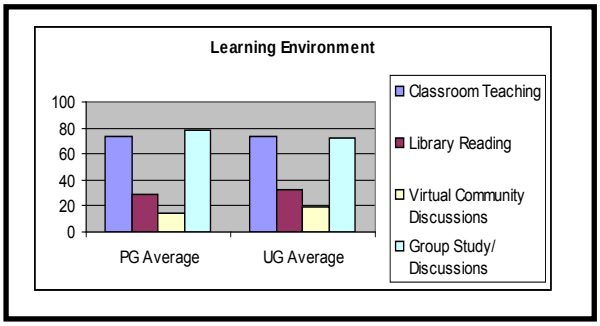

Figure 8. Graph for Indicator "Learning Environment"

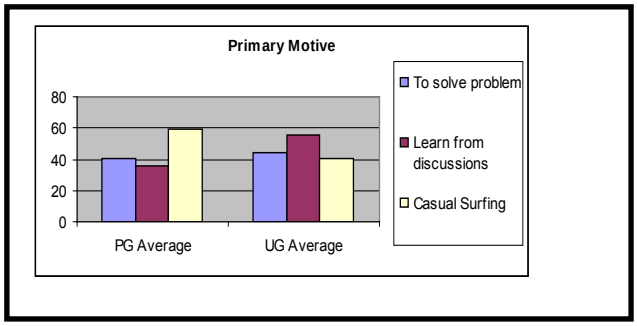

Figure 9. Graph for Indicator "Primary Motive"

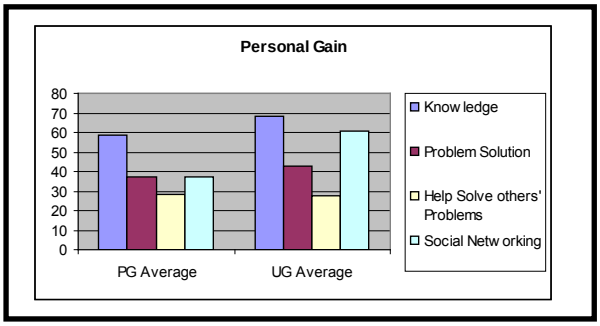

Figure 10. Graph for Indicator "Personal Gain"

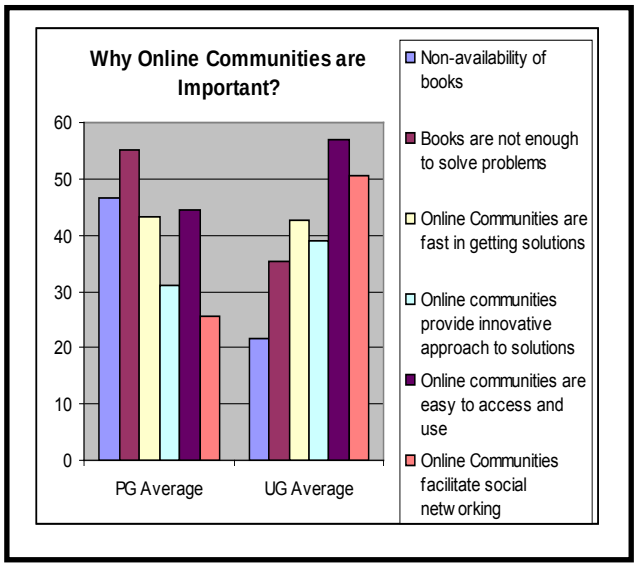

Figure 11. Graph for Indicator "Importance on of Online Communities"

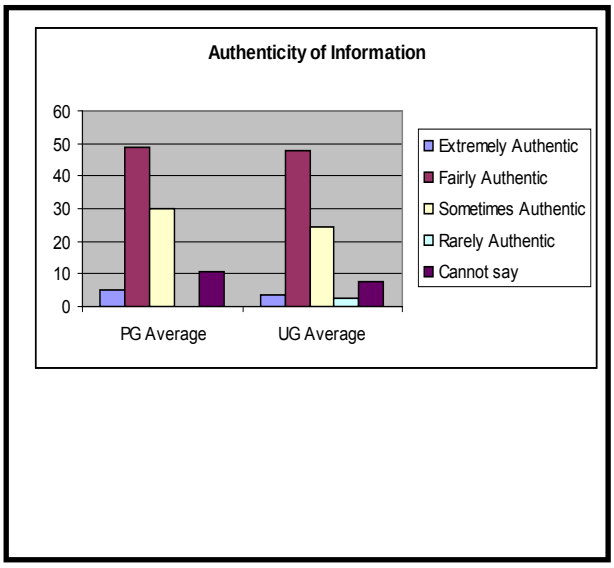

Figure 12. Graph for Indicator "Feedback authenticity"

4.2 Discussion

After a thorough analysis of the data and a rigorous study of related literature, the authors have discussed the various issues related to the role of Online Communities in academics. Some discussions have been explained in the following points:

a) Preferred Problem Solving Method

A clear majority of students prefer searching online resources for problem solving instead of consulting faculty or referring books or journals. Students from science discipline preferred asking questions to faculty as compared to social sciences' students. The science students also showed keen interest in books. This can be attributed to the high level of technicality of their subjects and also to the extensive research literature available from the field. Social sciences students have a difference in opinion on this as most of the problems faced by them are from the practical part of the profession and can be best solved in a case to case basis. Hence, they prefer the Online Communities where

they can find solutions to similar problems which they can mould as per their requirements and situation. Some science students are the least inclined to use Online Communities for their problem solving needs.

b) Preferred Learning Environment

Most Asian cultures have placed a high reverence on the teaching profession, as they encourage knowledge transfer from the learned to the other members of the society. Echoing this fact, a maximum number of students surveyed by us have given the maximum importance to classroom interactions in the presence of a teacher. These students think that library is important but cannot replace the student-teacher interaction. The other observation made was that a distinct majority of students prefer group study methods. This gives a clear indication for the future prospects of Online Communities in the days ahead as they also facilitate group knowledge transfer.

c) Primary Motive to Join Online Communities

Irrespective of their discipline, most of the students seek an immediate solution to their unsolved problems. Most of the surveyed students have stated that Online Communities are the fastest medium for fetching the solution to problems. This quality of Online Communities acts as a major motivational force for students to join them. Hence, students flock to such Online Communities to find a quick fix to their problems and in the process they learn from experiences of other people of the community.

d) Personal Gain

Only the Management (PG) and Information Technology (UG) students were extremely satisfied with Online Communities, as they found a proper solution to their problems. The picture is not so rosy as far as other students are concerned and this becomes a major area of concern for Online Communities and their role in student life. There is a very old saying “If you help others, someone is waiting to help you too”. A substantial percentage of surveyed students felt a deep sense of pride and satisfaction in solving other people’s problems on the online communities. This finding is extremely encouraging from the perspective of Online Communities.

e) Why Online Communities are important?

In this information era, where books are getting replaced by e-books and postal mails are getting replaced by electronic mails, students are eagerly welcoming Online Communities, as rapid tools for acquiring information and knowledge. This finding spells a great future for Online Communities and indicates a great role of such communities in the life of students in near future.

f) Authenticity of Information in Online Communities

One of the most important objectives of this study is to analyse the feedback of the students on "authenticity" of information found in Online Communities and their forums. A majority of surveyed students feel that information contained in Online Communities is fairly authentic but a low percentage (3%) of them feel that information available in online communities is rarely authentic. A small fragment of the surveyed students have remarked "cannot say" to the authenticity of Online Communities. Such students have either not actively participated in Online Communities or have visited them occasionally while surfing the web.

g) Views of Undergraduate students (UG) and Postgraduate (PG) students

1. Results clearly indicate and differentiate the status of undergraduate and postgraduate students as far as teacher – student interactions are concerned. Undergraduate students ask more questions to teachers and rely on them than their postgraduate counterparts.
2. Online search is found to be most favorite options for both categories of students. When it comes to problem solving, both categories of students refer to books/ journals. One important finding here is that neither the postgraduate students nor the undergraduate students prefer using Online Communities as the preferred choice for problem solving method.
3. As far as learning environment is concerned, both categories of students have given high preference to classroom teaching and also to Group study/discussions. Library reading and Online Communities are not the most preferred learning environment for these students.
4. There is very less difference between the two categories of students when it comes to joining online community to solve their problems, but the undergraduate students feel that studying Online Community discussions is a good learning method for them, as compared to their postgraduate counterparts.
5. Both the categories of students have similar preferences of using Virtual Communities to solve other peoples' problems, but more undergraduate (61%) students feel that Online Communities are conducive to social networking in comparison to postgraduate students (37%).
6. Postgraduate students agree with their undergraduate counterparts that Online Communities can provide the speediest method for problem solving, but they have a clear difference of opinion as far as the use of books and availability of books is concerned. Postgraduate students have not shown a great inclination of using books for solving problems.

5 Conclusion and Further Research

5.1 Conclusion

Present research primarily studied the role and importance of online communities in academic life of students. Data were collected and analysed statistically and based on the variety of investigations, following major conclusions were drawn:

- Students from all six disciplines were found to be very serious in getting solutions to their problems but MBA and IT have topped in the ranking so there is a good sign for future that people will show their interest in online communities.
- The comparative study showed a significant difference in PG students and UG students in terms of various dimensions of online communities.
- Searching online resources was found to be more attractive by the students in all the disciplines.
- Group study was found to be a right instrument in improving the performance of individuals and also enhancement in skills.
- Online Community has been considered as an advanced form of group knowledge sharing.
- Authenticity of information appeared to be very critical part of this study.
- It appeared that, personal gain in terms of knowledge was a motivational factor for students to join Online Communities.
- Online Community is not the only medium to find the solutions.
- Online Community is found to be a good medium for social networking between the students.
- Proper regulation and control mechanism required for trust among the students and continuous improvement in quality increase the confidence in students that will motivate them to join the community.
- All such variables like problem solving method, importance of Online Community, and learning environment were found to be great potential to get real direct benefits to students.
- Showing interest in joining the Online Communities was found to be the key to success of Virtual platform in the near future.
- Gaining knowledge emerged as a key factor and should be accepted as a concrete pillar in the success of Online Communities.
- Academic programs from management and information technology disciplines use technology in their course delivery, which acts as a major catalyst in motivating their students to participate in Online Communities.
- Proper information, seriousness and regular participation in Online Communities has witnessed tangible gains in academic life of students.

5.2 Further Research

There has been an ever growing feeling that Online Communities have been seriously suffering from lack of sincere participation, efficient reply and confidence. Fortunately, the awareness of Online Communities is increasing and attracting people to join the virtual platform to solve their problems, share their knowledge and ideas.

Present study remained confined to one University of UAE and covered six disciplines viz - MBA, MSc (Biotechnology), BSc (Information Technology), BBA, BA (Interior Design) and BA (Media and Communications). Future researches on similar lines could be undertaken in other parts of the world so as to make these findings more generalised and operational at national and international level.

Such ideas can force changes in designing of Online Communities according to requirements of people and should be equipped with highly technological environment, proper security, assurance to authentic solutions, and should give importance to intellectual property right/copyright. Government regulations for such Online Communities could also be set up so as to streamline their activities in the legal framework. After successful implementation of suggested changes, the participation in Online Communities would be really interesting and exciting in future.

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Theme 5

People, Skills and Education

A future in the past: unlocking a career in Britain's built heritage

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Abstract:
Britain's built heritage of six million historic buildings (NHGT, 2008) has a significant role to play not just as part of the nation's important buildings but also as an interest and educational resource for the general public (English Heritage, 2007). The UK spends approximately £5 billion a year on conservation and restoration, drawing on a wide range of skilled professions and crafts. The last ten years has seen a growth of concern from the sector about the developing skills shortage and the need for action to increase workforce levels for the future (NHTG, 2005 and 2008). This paper draws on research at the beginning of a PhD that seeks to investigate the underlying reasons for the shortfall in the built heritage sector of the UK and through this to identify innovative approaches that could improve recruitment of young people for the future workforce.

Keywords:
Careers, Conservation, Culture, Heritage, Skills shortage

1 Introduction

Britain has over 6 million historic buildings, a definition that refers to any building constructed pre 1919 (NHTG, 2008). These buildings play an important role in the future of Britain's built environment. Traditional building techniques and design provide stimuli and inspiration for creative new architectural design (DCMS, 2001). Maintaining the UK's historic buildings requires specialist knowledge on the skills and materials used in older buildings. The past decade has highlighted a major skills shortage within the heritage sector and a number of committees and groups have been set up to make improvements in the sector (DCMS, 2001; NHTG, 2005; NHTG, 2008). This research aims to investigate the underlying reasons for the skills supply shortage in the built heritage sector of the UK and explore the viability of a new approach to improve recruitment. Traditionally, access to professional careers in this area has been via the construction industry at a postgraduate level. This research focuses specifically on the possibility of giving the built heritage sector an individual identity and a clear career progression route from an undergraduate level, helping encourage entry for young people. This will be achieved through the following research objectives:

1. To examine the current situation of Britain's built heritage sector, in particular its approach to careers and recruitment, by establishing the importance of the built heritage sector within the UK; investigating the levels of workforce within the built heritage sector and its future labour needs; setting out a clear picture of how people are recruited into the sector and discovering who the decision makers are within the sector and their role in marketing and recruitment.

2. To investigate where lessons can be learnt and explore new approaches for recruiting, by comparing the culture within the built heritage sector with that of the rest of the construction industry and how this impacts on recruitment and retention of the workforce; exploring what lessons can be learnt from other similar subject areas e.g. Archaeology; drawing upon the experiences of other countries in their approach to careers in built heritage and exploring new ways of recruiting school leavers into the sector.

3. To suggest new approaches to recruit more people into a career in built heritage, by examining the marketing and branding of the built heritage sector and how new approaches could improve recruitment; ensuring the infrastructure is in place to support an increase in potential workforce, liaising with the main stakeholders to identify actions that can be implemented to attract more people to a career in the built heritage sector, achieving a sustainable workforce for the future.

This research is at a stage of designing the detailed data collection phase and plans to utilise a range of qualitative research methods including interviews and focus groups to collect data from young people making career choices, training providers, professional bodies and others. These are to be analysed within a grounded theory methodology with the aim that a theory as to how more young people could be encouraged to pursue a career in built heritage will emerge. This will be informed by a constructivist theoretical perspective and a subjective epistemology which reflect the ontological and epistemological positions of the researcher.

It is intended that this paper acts as an introduction to the PhD research highlighting that research is currently being carried out in this area. The research aims to present an original contribution to knowledge by liaising with the main stakeholders to identify actions that can be implemented to attract more young people to a career in the built heritage sector, helping to achieve a sustainable workforce for the future which in turn will lead to the appropriate level of repair, restoration, maintenance and conservation of the historic buildings of the UK.

2 Literature Review

2.1 The importance of Britain's built heritage sector

Historic buildings can act as a portal into the past, shedding light onto how past generations lived, representing the history of every community that have settled in the UK (DCMS, 2001). Many historic buildings are owned privately, while others are owned and managed on the public's behalf by organisations such as English Heritage and The National Trust who open many such buildings for the public to appreciate. In

2006 'History Matters' was launched by a partnership of heritage organisations including English Heritage, the National Trust, the Heritage Lottery Fund, the Civic Trust and the Council for British Archaeologists. Over a four month period over 1.1 million people showed their support that 'history matters' by taking a badge or making an online declaration (English Heritage, 2007) showing the importance Britain's built heritage has among the general population.

The upkeep and maintenance of Britain's historic buildings represents a large proportion of the mainstream construction industry, with the UK spending approximately £5 billion a year on conservation and restoration within the historic built environment (NHTG, 2008). There is a large network of skilled building professionals with the knowledge and understanding of the methods and materials required to restore, maintain, conserve and repair the UK's historic buildings in line with a strong conservation philosophy, ensuring these buildings will be around for future generations to enjoy.

2.2 The levels of workforce within built heritage

The last 10 years have shown an increasing awareness of the major developing skills shortage within the built heritage sector and there have been numerous reports, such as The Heritage Lottery Fund's 'Broadening the Horizons of Heritage' (2002) and Traditional Building Craft Skills - Addressing the Need, Meeting the Challenge (NHTG 2005), that have highlighted some of the issues facing workforce levels within the sector. Employment within the sector falls within two main categories, craft and professional. England employs 86,430 people in the craft side of the sector, although it was estimated in 2005 that a further 6,500 crafts people were required over the following twelve months to meet demand (NHTG, 2005). Many of the main bodies within the built heritage sector have identified that due to a lack of people entering the sector and many people retiring, there is a fear of a major skills shortage in 15-20 years time (Rogerson, 2007). The latest skills needs analysis of the UK built heritage sector to be carried out by The National Heritage Training Group (NHTG, 2008) in partnership with English Heritage, entitled Current Skills, Future Training, highlights that there is approximately 542,249 building professionals within the UK, including Architects, Surveyors, Engineers, Planners and Project Managers and although it is impossible to accurately quantify, it is understood that a significant proportion of these professionals carry out work on pre 1919 buildings even though only 507 are accredited members of conservation professional bodies (NHTG, 2008). The report suggests that the industry would have to attract around 88,000 new entrants every year until 2010 to meet demand.

2.3 How are people recruited into the sector?

English Heritage plays a large part in educating the general public, helping them to understand the value and importance of the historic environment with the aim of passing on the desire to care for it. English Heritage's corporate strategy, 'Making the Past part of our Future', aims to create a cycle of understanding, valuing, caring and enjoying (English Heritage, 2005). English Heritage is achieving this by using Britain's historic assets to attract school groups, adults and families to interact with the buildings of the past through educational visits, workshops, tours and activity days such as the Festival of History and the Heritage Open Days (Impey, 2006). Despite the huge public interest in Britain's heritage, there is little evidence of understanding about a link between

interest and following a career in this area. One of the major barriers to recruitment is the lack of awareness of careers within built heritage. In recent years, numerous groups, forums and committees have been set up to address this. January 2007 saw the re-launch of a careers guide for the built heritage sector by the National Heritage Training Group (NHTG) incorporating for the first time careers in both the craft side and professional careers in the sector (NHTG, 2007). Heritage Lottery Fund Training Bursary Schemes were launched in 2006 awarding £7 million to 10 bursary schemes across the UK in various heritage based skills. The schemes aim was to improve the quality and quantity of skilled workers in the heritage sector by developing innovative, work-based training opportunities where new skills and best practice could be passed on to new, enthusiastic recruits (English Heritage, 2007).

Although the sector as a whole is concerned with recruiting at all levels, this study focuses on the recruitment of young people into the sector. There is a view that more needs to be done to inform young people about the exciting jobs that lie in heritage and that a greater profile for built heritage in schools could help achieve this (NHTG, 2008). Aspects of Britain's heritage and the built environment can be explored through many different school subjects, however the Heritage Environment Review Executive Committee (HEREC, 2007) report that the National Foundation for Education Research have identified, through teachers, head teachers and governors, that whilst school staff appreciate the built environment as a means of cross-curricular applications, they are often uncertain of how to integrate it into lessons. English Heritage has produced a range of material and plays a key part in promoting Britain's built heritage as a resource for use within the school curriculum. It runs courses for teachers and as a member of the Qualifications and Curriculum Authority, advises on material for both the history and citizenship aspects of the National Curriculum (DCMS, 2001). The idea that the heritage message is not reaching career conscious young people is echoed by the NHTG who report that a "lack of awareness of the career opportunities, a poor image of the heritage sector, and less than adequate coverage of traditional building techniques in relevant mainstream undergraduate curricula are thought to be responsible for the lack of interest in the sector by new entrants" (NHTG, 2008, p. 13).

2.4 How does working culture impact on recruitment into the sector?

Much of the literature suggests that the construction industry suffers from a poor image and this is often linked with the working or organisational culture that exists within the industry (Egan, 1998; Greed, 2000; NHTG, 2008). There is however, very little evidence within the literature that culture within the built heritage sector has been explored. Greed (2000) writes about the negative culture that, she argues, exists within certain elements of the industry and describes construction as "a hostile world inhabited by the construction tribe, which is itself divided into competitive, aggressive sub-tribes, corresponding to the different professional bodies and specialism's within construction" (Greed, 2000, p. 1). Dainty et al. (2000) corroborates this, describing the on-site construction culture as being a masculine, threatening environment where conflict and crisis are engrained. However, as Gurjao (2008) explains, although the image of construction is one associated with brick laying and brute strength, the industry is becoming high-tech, requiring more mental strength in a complex industry that includes consultancy, design, manufacturing and supply. Gurjao further highlights that the construction industry is making significant changes to enhance inclusivity and diversity

in the workforce and argues that as well as the current recruitment initiatives, the industry also needs to focus on translating qualifications into employment and the retention of its diverse workforce. The construction industry consists of many sub groups and a range of cultures and while built heritage is one of those sub groups, the cultural attributes of this sector appear to differ from the negative culture as described (Buxton, 2004).

2.5 Could lessons be learnt from similar subjects such as archaeology?

Another profession concerned with caring for the past is archaeology. Archaeology attracts a large amount of interest as both a hobby and a career (Aitchison and Edwards, 2003). In 2001 60,000 visitors participated in the two National Archaeology Days held at 149 sites across the country (English Heritage, 2002). Archaeology can be studied at almost any level with over 900 courses up and down the country delivered as evening classes, GCSE, AS level, A level, diploma, degree, post graduate and PhD level (Learndirect, 2008). Once trained however, entering the archaeological professional sphere and sustaining a career in it is more difficult. 98% of professional archaeologists in their 20's hold a degree qualification indicating that academic qualification at this level is a prerequisite (Aitchison and Edwards, 2003). The number of individuals studying archaeology far outnumber the total number of archaeologists in professional practice, meaning an oversupply of newly qualified archaeologists with a very few jobs advertised (Aitchison, 2004). Aitchison further surmised that students studying archaeology have unrealistic expectations of a career in this area. The few graduates that do find employment are often faced with low pay and poor working conditions with many only being employed on short term contracts (Everill, 2007). Although the career prospects for newly qualified archaeologists are limited, the interest in the subject and subsequent recruitment onto courses is high. Aspects of the archaeology sector could serve to inform any strategy for change in built heritage.

2.6 Conclusion of the literature and research rationale

The literature has identified the importance of maintaining Britain's built heritage and confirmed the skills shortage within the workforce trained in the conservation philosophy and with the knowledge of historic building techniques and materials. The literature review had demonstrated that further investigation is required into the culture of the built heritage sector and how this compares and contrasts to the rest of the construction industry and how lessons may be learnt from archaeology and other European countries. This research aims to explore these areas more fully in order to establish the viability of a new approach to improve the recruitment of young people into the sector.

3 Research Methodology

The methodology examines the reasoning and rationale behind the research design adopted to realise the objectives of this study. This research utilises a range of research methods including interviews and focus groups that are analysed within a grounded theory methodology that is informed by a constructivist theoretical perspective and a subjective epistemology, which together come within an overarching qualitative paradigm.

To investigate the issue a skills supply and theorising about new approaches to recruitment, involves a close look at the three dimensional web of the people and processes involved in the sector. The data collection and analysis need to be deep and rich in order to give an understand full of meaning. There is a need to identify and understand the systems and processes, the 'experts' views and why things are currently done as they are. An essential element to the approach is the researcher's position within the research setting and how this will affect the research. This is not the kind of study that seeks to control the variables in order to create research that is easily generalised. It is looking at people as individuals with uncontrollable social variables, which it is hoped, will create new opportunities to knowledge and the generation of theory. The quantitative approach maintains that the world can be understood and explained by using the right types of techniques to reveal objective facts and then generalise to the wider population. However, people are as intricate in their thinking as the intricate web of the organisations and institutions that make up the built heritage sector and their views are shaped by experience and circumstance. The research is set in a very specific context and findings from the research will be contextualised. It is for these reasons that a qualitative approach has been adopted. From under the banner of qualitative research, the stages of the research process will be discussed under the headings, epistemology, theoretical perspective, methodology and methods of inquiry.

3.1 Epistemology

Behind the various stages of the research process lies the biographically situated researcher (Denzin and Lincoln, 2003). Epistemology is concerned with "the nature of the relationship between the would-be knower and what can be known" (Guba and Lincoln, 1994, p. 108). This piece of research has developed out of a personal desire to achieve change within a familiar setting and this undoubtedly has an effect on how the research is to be conducted. Having worked in the built heritage sector as an Historic Building Surveyor for over five years and with a passion for historic buildings since the age of twelve, the researcher has had personal experience of the sector and some of the issues it is facing. From this experience they have developed ideas and theories about how the sector could progress. This research aims to take those ideas and theories and develop them, discovering how and where improvements in the sector can be made. Traditional approaches in the research realm, such as the naturalist qualitative perspective that incorporates post positivism and realism, are of the opinion that the researcher must remain separate from the research, taking a 'fly on the wall' approach in order to reach objectivity. At the opposite end of the scale within the qualitative perspective, the researcher is recognised as part of the research setting (Holliday, 2007).

The researcher has a close relationship to the research subject having had to make the decision themselves to chose a career within the built heritage sector. The researcher's personal involvement with what is to be researched defines them as an 'insider' (Kemmis and McTaggart, 2003), as well as being the researcher, they make up part of what is being researched. The more traditional research approaches believe that this 'insider' approach affects the validity of the research (Rooney, 2005). Feldman (2003) explains that within traditional studies, validity usually referred to the degree to which the study accurately reflected the issue or topic that the research was attempting to measure. This positivist approach assumes that science can produce objective knowledge or 'truth' (Hammersley, 2000). Hammersley (2000) argues that the

researcher must remain objective and essentially be viewed as an 'outsider', independently observing and the researchers subjectivities are believed to distort and invalidate the reality. In more recent times new ontological and epistemological models have emerged which fundamentally change the previous positivist models. These include approaches such as constructivism and postmodernism (Rooney 2005). As these approaches developed and less emphasis was placed on purely objective knowledge, the criteria for validity also changed to include factors such as credibility, believability and reliability (Guba quoted in Cohen et al., 2000). While positivists viewed validity as dependent upon the objectivity of the researcher, the post modernists and constructivists argue that the researcher's subjectivities are central to the research process (Rooney 2005). Rather than uncovering an 'objective truth', Crotty (1998) describes these new models as looking at creating truth or meaning through engaging with the realities in our world. Holliday (2007 p.120) describes this approach as personally recognising the researcher as 'an ideological force which impacts on relations with people in the research setting'. Rather than trying to eliminate the effects of the researcher on the research setting, Holliday suggests we should instead use reflexivity to understand and communicate these effects. To achieve reflexivity, Schutz's (1970) suggests adopting the notion of a stranger approaching a new culture or by making the familiar seem unfamiliar. This approach ensures the recording of all data and allows a fresh look at elements that may have once been taken for granted. Although my past experiences will not form part of the systematically collected data, they will go some way in being able to understand others viewpoints. Holliday portrays this idea as not speaking on behalf of the participants but speaking for myself as someone who understands their situation.

Due to the very nature of how this research came about and the researchers position as an insider, the epistemological view is required to be subjective in nature. This, in turn, has an impact on the theoretical perspective to be adopted for the study as only a few allow room for such a close relationship between the researcher and the research.

3.1.1 Theoretical Perspective

A theoretical framework acts like a backbone for the research and requires the researcher to choose a paradigm that is congruent with their beliefs about the nature of reality or ontology (Mills et al., 2006). Denzin and Lincoln (2003) highlight four major paradigms that influence qualitative research: Positivist and Post-positivist; Constructivist-interpretive; Critical and Feminist/Post structural. Each of these paradigms encompass different epistemological theories and have each developed within a different ‘historical moment’ within the history of qualitative research (Denzin and Lincoln, 2005). The concept of a historical moment is fixed in time, however the paradigms that develop within these moments transcend the boundaries of time and are adopted as part of the theoretical framework for present day research. This study adopts a constructivist perspective which originated within Denzin and Lincoln’s defined blurred genres moment (Denzin and Lincoln, 2003, 2005).

Constructivism is a research paradigm that denies the existence of an objective reality, “asserting instead that realities are social constructions of the mind, and that there exist as many such constructions as there are individuals (although clearly many constructions will be shared)” (Guba and Lincoln, 1989, p. 43). This research, by

rejecting an objective reality, assumes a relativist ontological position, believing that the world is made up of multiple individual realities influenced by the context, norms and surroundings of the individual (Mills et al. 2006). Constructivism is a worldview in which individuals try to understand and seek meaning in the world in which they live and work. These meanings are as many and as varied as the individuals, that are shaped by their interaction with others and the historical and cultural norms that surround them (Creswell, 2007). It is the researcher's role to delve into these complex meanings intent on making sense of the way others view the world.

The epistemological and ontological positions of this research within the constructivist perspective lead to the exploration grounded theory as a methodology, more in particularly, the constructivist grounded theory of Chamaz (2005) who grounds her theoretical orientation in the views or perspectives of individuals (Creswell, 2007). Grounded theory is a methodological strategy that seeks to construct theory about issues of importance in peoples' lives (Strauss and Corbin, 1990). The idea being that there are no preconceived ideas to prove or disprove, but rather issues of importance to participants emerge through the collection of data, which is then analysed by constant comparison, to generate theory that are grounded in the data (Mills et al. 2006).

Glaser and Strauss developed grounded theory in the 1960's. Grounded theory uses 'a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon. The findings of the research constitute a theoretical formulation of reality under investigation, rather than consisting of a set of numbers, or a group of loosely related themes' (Strauss and Corbin, 1990, p. 24). Grounded theory has been adopted for this research as the there is very little known about the skills supply shortage in the built heritage sector of the UK and the viability of a new approach to recruitment in this area. Grounded theory allows the opportunity for new theory to emerge as to how more people could be recruited into this area of work. Since the 1960's different styles of grounded theory have emerged. Mills et al. (2006, p. 2) describe the variations of grounded theory as reflecting their epistemological underpinnings that exist upon a 'methodological spiral' and that the type of grounded theory adopted depends on 'the nature of the relationship between researcher and participant, and on an explication of the field of what can be known'. In more recent times a new set of procedures relating to constructivist grounded theory have emerged that relate to my epistemological, ontological and theoretical view and will be adopted in this study.

Charmaz (2005) explains that constructivist grounded theory adopts the general grounded theory guidelines as tools, but doesn't ascribe to the objectivist, positivist views of the earlier styles. Instead she explains (p. 509) that the "constructivist approach emphasises the studied phenomenon rather than the methods of studying it". This in turn leads to a more 'flexible' approach (Creswell, 2007). This approach focuses on the development of theory that takes into account the researchers view, learning about the experience through deep, hidden networks, situations and relationships and making visible the hierarchies of power, communication and opportunity (Charmaz, 2006). The role of the researcher is acknowledged and Charmaz highlights that throughout the research process, the researcher is making decisions about the categories, questioning the data and advancing personal values and experiences.

3.1.2 Methods of inquiry and data collection

It is proposed that primary data will be collected through a series of interviews, focus groups, and a small scale case study to gather enough information to construct theory, grounded in the collected data, about improving recruitment of young people into the built heritage sector. The resulting theories will then be used within the Delphi technique to draw out the views and opinions of the major stakeholders whilst strategising how any new theories on recruitment might be implemented. The Delphi technique is described by Linstone and Turoff (1975 p.3) as 'a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem'. This process allows individual opinions to be developed into group consensus within the major stakeholders, on how the theories developed in the first stage of data analysis could be implemented within the sector, allowing change to take place. The methods of inquiry and data collection will be developed in detail as part of the next stage of the research process. A detailed plan of data collection and the issues surrounding each area of inquiry will be established and each of the areas of data collection will be timetabled into the 2nd year of the research.

4 Findings and Discussion

The literature reviewed has revealed that although there are major initiatives and drives to engage young people with history and the built heritage (DCMS, 2001; English Heritage, 2007), there seems to be a missing link between education and careers, an area that requires more detailed investigation within the research. The literature has also highlighted that conservation, restoration, maintenance and repair play a significant part in mainstream construction (NHTG, 2008). The question needs to be asked as to how much, if any, historic building education is included the mainstream built environment courses?

There seems to be very little literature available regarding the working culture of the built heritage sector and the cultural aspects are not fully understood. From a personal perspective, having worked in the built heritage sector, the working culture within is built around a passion for historic buildings. There exists a shared appreciation for the preservation, restoration and conservation of old buildings. Research has been done on young people and perception of construction, and this needs to be closely examined and unpicked to understand the differences with built heritage if a successful approach to recruitment is to be identified.

5 Conclusion and Further Research

This research aims to investigate the underlying reasons for the major developing skills shortage in the built heritage sector of the UK and through this to identify innovative approaches that could improve recruitment of young people for the future workforce.
The literature has established the importance of maintaining Britain's built heritage and confirmed that due to a lack of people entering the sector and many people retiring, built heritage is facing a major skills shortage within both the craft side and the professional disciplines. The literature suggests that although many young people are visiting

historic buildings there seems to be a missing link between the taught subjects and careers. The traditional 'male' image of construction is changing as the industry becomes more high-tech although there is little literature on the image and culture within the built heritage sector of the industry. The literature has highlighted a need to explore the potential links that could be made with archaeology and lessons to be learnt from other sectors and other nation states. The research proposes to use a range of research methods including interviews and focus groups to collect data from major stakeholders, education and training providers and young people making career choices. The data will be analysed within a grounded theory methodology that is informed by a constructivist theoretical perspective and a subjective epistemology, which together come within an overarching qualitative paradigm. Once theories have been established, the Delphi method will be utilised to gain a consensus of opinion from the stakeholders, on ways to address the growing skills shortage and increase recruitment of young people into the UK's build heritage sector.

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The Role of Culture in Libyan Public and Private Organisations

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Abstract:
A critical review of available literature is presented, which relates to the impact of culture on communication behaviour in public and private organisations. This is in order to identify deficiencies in the area of study as well as to draw some lessons for future research. The focus is primarily on the effect of culture values on communication in Libyan public and private organisations. Key issues associated with definitions of culture, communication behaviours and organisational culture are considered and discussed. In addition, a critical review and synthesis of related studies on the effect of local Libyan cultural values on the communication behaviour of individuals in organisations are addressed. In conclusion, the paper argues that the role of culture in communication behaviour in organisational settings is complex. The paper also points to the fact that Libyan culture reflects 'high power distance', 'masculinity' and uncertainty avoidance. The implications of these complex issues to research strategy and design are also documented together with recommendations for researchers.

Keywords:
Culture, Libyan local culture, Communication behaviour, public and private organisations

1 Introduction

The theoretical and intuitional field of cultural studies has developed over the past three decades, during which time various problems, issues and debates have emerged from within the literature. Thus, this review considers the influence of Libyan culture on the communication behaviour of individuals in Libyan organisations. In this paper recent cultural studies are examined in order to investigate the impact of societal culture on communication among staff in Libyan public and private organisations and to provide suggestions for future research on this issue. It also analyses the extent to which power distance, masculinity, collectivism and uncertainty avoidance affect the communication behaviour of individuals in terms of harmony and organisational hierarchy structure in Libyan organisations. This paper draws on and ongoing doctoral studies in the area of . This paper, however, is primarily based on a thorough and critical review of literature. It documents and discusses key issues drawn from related literature and areas

communication behaviour, culture organisational dynamics and power influences in public and private organisations in Libya. Academic journals, conference proceedings, text books and websites are the main sources of information.

2 Methodology

This paper draws on and ongoing doctoral studies in the area of improvement quality of communication in Libyan planning organisations. This paper, however, is primarily based on a thorough and critical review of literature. It documents and discusses key issues drawn from related literature and areas communication behaviour, culture organisational dynamics and power influences in public and private organisations in Libya. Academic journals, conference proceedings, text books and websites are the main sources of information.

3 Definition of culture

Culture is strongly connected with communication and is defined in many ways. Martin et al, (2004, p. 337) have defined culture as “learned patterns of behaviour and attitudes shared by groups of people”. Moreover, the American Psychological Association (2002) defined culture as “The belief system and value orientations that influence customs, norms, practices and social institutions including psychological processes (language, care taking practice, media and educational systems) and organisations (media educational system)”. Thus, culture at the societal level is manifested in values and less in practice. However, culture at the organisation level is more likely to be manifested in practice and less in values (Hofstede, 1997). Therefore, culture can be defined as the shared patterns of behaviours and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. These shared patterns identify the members of a culture group while also distinguishing those of another group.

4 Organisational culture

Organisational culture has been studied from a variety of perspectives, ranging from disciplines such as sociology and anthropology and social psychology. A definition of culture developed in each of these disciplines was provided by the cultural geographer Haggett (1975, p. 238): Culture describes patterns of behaviour that form a durable template by which ideas and images can be transferred from one generation to another, or from one group to another. Every organisation has a different culture. Organisational culture tends to include the beliefs, values, norms and patterns of action that characterise social relationships and are reflected in the structures and processes within an organisation (Schein, 1988; Hyde and Williamson 2000).

In the literature the definitions of organisational culture is diverse. Among these definitions, the definition of Hyde and Williamson (2000) is widely quoted, which defined organisational culture as, “a pattern of shared basic assumptions that the organisation asserts are important as guides to the way people should behave to solve its problems of external adaptation and internal integration to achieve its goals and

objectives". Thus, as noted previously, culture at the societal level is manifest in values and less in practice. However at the organisational level it is more likely to be in practice and less in values (Hofstede, 1997).

Therefore, many studies and training programmes which are now available include courses in cultural communication, which contains models of culture and cross-cultural communication skills (Graft, 2004). Each organisation has its own cultural patterns, organizations' culture stems from "the shared beliefs and values that influence the behaviour of organizational members" (Schermerhorn, et al., 2005, P.9). Communication aims to achieve these goals and objectives in organisations. Moreover, communication allows members of the organisation to exchange information to achieve their tasks (Lee, 2005). Thus, employees in organisations work between two systems of values; their cultural background value system and the organisational value system, both of which usually share the same values but to achieve different objectives. Organisational culture affects the way in which people consciously and subconsciously think, make decisions and ultimately the way in which they perceive, feel and act (Schein, 1990). For example, loyalty to a group is an important cultural value in Libyan society; on the other hand, loyalty to the organisation is also an important value in organisational culture (Abubaker, A. 2007).

Such value will affect the communication behaviours of individuals in the organisation (Hyde and Williamson, 2000). Due to national cultural influences, Twati and Gammack (2004) consider organisational culture in Libya as a strong culture, which resists organisational change in many ways, including the decision making process, communication, employment, professionalism and other aspects.

5 Communication behaviour

In the literature there are many definitions for organisational behaviour. Gibson, et al (2000, P.5) described organisational behaviour as follows: "The field of study that draws on theory, methods and principles from various disciplines to learn about individual perspectives, values, learning capacities and actions while working in groups and within the total organisation; analysing the external environments effect on the organisation and it's human resources, mission, objectives and strategies". Also, Daft and Noe (2001, P.4) defined organisational behaviour as: "The actions and interactions of individuals and groups in organisations".

Communication is widely studied as a means of transmitting ideas as part of culture (jandt, 2004). Communication can be divided into three types: verbal (use of words with specific meaning), paraverbal (tone of the voice), and non-verbal communication. Nonverbal communication can be defined as communication without words while verbal communication is defined as communication with words (Remland, 2004). It has also various components, such as encoding, message, channel, receiver, decoding and receiver response in achieving success in communication. Therefore, communication behaviour is divided into verbal and non-verbal.

5.1 Verbal communication

Communication and culture are strongly related to each other. Thus, the study of communication in Western culture has a recorded history of some 2,500 years begun in Greece with Aristotle's Rhetoric and Poetics, and which described the process of communication as involving a speaker, the speech act, an audience, and a purpose (Jandt, 2004). The basis of communication is the interaction between people. Verbal communication is one way for people to communicate face-to-face. Some of the key components of verbal communication are sound, words, speaking, and language. In spite of the fact that the main element of communication is language, and all languages are similar in linguistic structure, they may express different cultural aspects (Fisher, 1978). According to Wary and Grace (2007) the cultural diversity plays an important role in misunderstanding in exoteric communication. This concludes that each culture seems to have its own characteristics, which lead to various studies and approach to communication. The understanding of the hearer is the responsibility of speaker, who must take further steps to clarify his message. Therefore, the understanding of the cultural background of the listener and clarify the message has an important role in facilitating communication (Jandt, 2004).

5.2 Non-verbal communication

Non-verbal communication is a very important carrier of information. It includes facial expressions, eye contact, tone of voice, emotions, attitudes, and feelings shown in different gestures, and body language (Hargie and Dickson, 2004). Its role is highly significant and essential in social interactions. One of the most important non-verbal signals in social interactions is eye contact. Eye gaze is defined by Argyle (1988) as "the meeting of two peoples gaze or their looking into each others eyes". Furthermore, Argyle (1988) suggests that 'People look more at those they like'. On the contrary reduction of gaze is often a sign of disapproval, a lack of control, ignorance, or a lowered level of intimacy, depending on the interactions context. The facial expression is an affect display; it shows the emotional state of the individuals. It is significant that an inappropriate facial expression my well block effective communication. For example, in Libya culture most people unintentionally use facial expression to express fear, sadness, happiness and surprise (Twatti, 2006). These facial expressions are less likely to be understand by another people from different cultural background. (Samover and Porter, 2004). The face saving strategy is one of the main approaches in Libyan communication. This may be due to Libyan society structure, because in Libyan organisations, employees care about the reputation of their names, families and tribes. Therefore, societal reputation is a very important element for societal relationship in Libyan society (Twati, 2006).

6 Public and Private Organisations

According to Senior (McNamara, 2001), an organisation is a group of people working together to achieve the same goal. In the beginning, organisational studies concentrated on moral bases of management, leadership and dynamism of bureaucracy. In the second half of the last century there were different studies about organisational structures, activities and relationships between organisation and their communities (Boden, 1994). In traditional political science literature it is emphasised that there are distinct

differences between private and public organisations (Lane, 1993). Most public organisations do not have the same strategic freedom that private organisations have since some of their strategic goals are decided by politicians. This puts constraints on public organisations' ability to operate and may in some instances force public organisations to make decisions that are not sound for society at large (Lane, 1993). This also affects the resources available to public organisations. They do not always have the resources needed in order to meet demands, making it necessary for public organisations to prioritise which customer/user to serve. This is a situation unfamiliar to private organisations (Eskildsen, j. k. *et al.,* 2004).

A further feature of traditional public organisations is that they are subject to political rather than market controls. External controls on private organisations are market controls such as competition, consumer constraints and shareholders interests. Instead, public organisations have traditionally been constrained by political authority and political activities. Their objectives, structures, and processes have often been defined by central bureaucracy agencies or constrained by legislation (Cole, 1988).

In Libya, communist public organisational systems are adopted in many sectors, such as business, education, health, and media in addition to other social and political organisations. Due to globalisation, organisations in Libya have adopted western models without considering their local cultural values. This leads to conflict between organisational values and national values (Al-hamadi et al, 2007). The allure of globalisation has affected most of Libyan organisations (public and private). It has also created a huge debate about organisational values and the methods of dealing with social issues in Libyan organisations. In the early 1970s there were few women who went to study in schools or to work in organisations. However, nowadays women are more than men in schools and especially in the areas of humanity and social public services. This is due to availability of education and to cultural changes (Twatti, 2006).

7 Libyan Culture – Key Concepts and Values

Libyan culture involves a closely interwoven network of relationships that takes time to establish and maintain. The concept of "wasta", roughly translated as "influence", is a direct consequence of these personal relationships together with family ties, trust and honour. In Libya, this relates to the importance of having personal contacts in influential places so rules can be bent or things done more quickly. As a system based on the reciprocation of favours, 'wasta" permeates all aspects of Libyan society and is particularly prominent in business settings. "Face", the values of social status, respect, and personal dignity where protecting the honour of one's family and the collective good is paramount to Libyans. "Face", although often associated with countries in the Far East, also plays a significant role in Libyan culture (Communicaid Group Ltd, 2007). Therefore, all business dealings in Libya are based on reputation and rely on the development of trust.

Libya is an Arab country and shares common cultural values, language, religion and other social values with the Arab countries. In Libya the official language is Arabic and the dominant religion is Islam. This religion has a serious role in shaping Libyan cultural values (Vandewalle, 2006). The great majority of Libyans follow the Sunni

branch of Islam and the traditions of Muslim society. Today, Libyans are, in general, conservative without being fundamentalist in their approach to religion. However, as a Muslim state, the heritage of Islam is deeply rooted in the character of the Libyan people and for most it is an integral part of their daily life. Islamic rule pervades Libyan customs and culture, providing the framework for the behaviour of individuals in both social and business contexts. Therefore, care must be taken to respect this, particularly in the area of dress, language and behaviour (Communicaid Group Ltd, 2007).

This lead many authors to generalise their cultural studies on all of the Arab countries, which leads to generalisation in cultural studies and about Libyan culture in particular. In Libyan society, Islam is considered a comprehensive religion covering social and political aspects as well as piety of soul and normal principles of people's behaviour (Twati, 2006). According to Ali (1988), hard work is seen as virtue, and those who work hard are more likely to get ahead in life, and get the respect of people in the place of work. Therefore, in Libyan organisations social relations at work are also encouraged. Thus, it is important to have good relationships with your colleagues and leaders, because links inside and outside work can be vital elements in achieving successful communication among staff (Yousef, 2000). The idea of a common humanity is a central belief in Islamic religion. Thus, it is mentioned in the Koran that God created people from different tribes and nations to know and appreciate each other. Consequently, Muslims know that they must embrace and respect even those who may be not belong to their community, religion, or nation (Akbar, 2003). This supports the views of Leat and El-kot (2007), who argued that harmony and the maintenance of social relationships are very important characteristics of Arabic culture. Hence, respect, establishing and maintaining relationships with strangers are strongly recommended in Arabic culture. Therefore, due to Islamic culture, Libyan society which consists of different tribes and families have strong social relationships ties (Twati, 2006).

In the literature, studies on culture and national cultures have an important role in forming the characteristics of society's members from an early age. Furthermore, the existence and stability of national culture values over long periods is due to their transfer from one generation to another (Hofstede, 2001), so we cannot get rid of them easily. In addition, these values are considered as a type of belief concerned with what is good or desirable. They also motivate behaviour and guide evaluations and decisions (Hyde and Williamson, 2000). Thus, individuals are expected to act according to these values. Additionally, Ali (1986-87) argued that Islam is one of the most influential factors which have shaped current Arab value systems. Consequently, it is more likely that those who believe in Islam and practice it tend to be more committed to their organisations and more satisfied with their jobs.

Therefore, Islamic religion affected Libyan culture, the communication behaviour of employees and the organisational culture in Libyan society.

8 Libyan Culture and Hofstede's Dimensions

Hofstede (1980) conceived culture as a construct which manifests itself in an organisation as a result of the organisation's location within a particular society. On the basis of an extensive analysis of 88,000 responses to a questionnaire survey of IBM

employees in 66 countries, Hofstede argued that there are four discrete dimensions of culture: Individualism versus collectivism. Uncertainty avoidance. Power distance Masculinity versus feminism.

The IBM study is considered to be one of the most important study on the relation between Libyan cultural values and organisation culture in Libyan organisations. The influence of Libyan culture can be seen in the findings of Hofstede in the IBM study. Hofstede's research shows how national culture affects the values of the organisation in a society. The study examined the attitudes held by employees in IBM branches, in three regions and fifty countries which Libya was one. According to this study, Libyan culture is characterised by high power distance, high masculinity, high uncertainty avoidance and low individualism. According to Hofstede, all these factors have contributed negatively to the communication among staff in the decision making process. He argues that most of the appointed managers in this region held high power distance and uncertainty avoidance, which affect decision and communication in Libyan organisations. This supports the view of Leat and El-kot (2007), who argue that the findings of Hofstede (1980) complement the Islamic work ethic and other Islamic values. Also, Hofstede's findings are in agreement with the study of Twati (2006). In his study, he found that Libyan culture still has strong power distance, masculinity and uncertainty avoidance as what Hofstede indicated in his IBM findings.

9 Critiques of Hofstede's work

As in the case of many studies of culture, Hofstede's work has various weaknesses. First of all, as Leat and El-kot (2007) claim, Hofstede generalised his result in some cases, such as all Arab countries. Moreover, Hofstede considered the attitudes of his samples as the main elements in judging their cultures. However, many cultures have diverse and wide range of culture groups, including dominant and subordinate social groups, as is the case in many of the countries where the study was conducted (Mead, 1998). Moreover, Hofstede studied only one computer industry, and single multinational company IBM. In many of the countries examined, the values of employees typically represent only a small group, who are educated, middle class and live in cities (Mead, 1998). Furthermore, the study of Hofstede faced various technical problems in terms of the changing attitudes of the participants. For instance, in large power distance cultures, powerful people may pretend to be less powerful than they are. In addition, in masculinity cultures men are supposed to be ambitious and tough, but they appeared to be more understanding and accepting of the role of women in the organisation (Hofstede, 1997). Another criticism of Hofstede's work is oversimplifying both concepts of individualism and collectivism (Scheper, 2006). Finally, in terms of historical development, Hofstede (2001) considers that cultural change over time is an essential element which might invalidate scores on the indexes in the national cultural context.

10 Libyan Culture and Communication in Organisations

Libyan culture is considered to be a traditional culture, and Libyan society consists of large tribes and extended families which might be due to the strong influence of the religion of Islam. According to Hall (1969), Libyan culture is considered a contact

culture, where people from the same sex can stand and walk side by side near each other. However, in communication between different genders it seems to be a strict culture. Therefore, in terms of communication between individuals in organisations, there are some issues that should be considered in communication behaviours. For example, eye contact and the use of personal space are very sensitive issues, and easily cause embarrassment in Libyan culture, especially between males and females (Samovar and Porter). In Islamic culture it is not allowed to close office door when talking to a colleague of opposite sex. We can argue that in this culture many cultural values are based on religion, leading to gender differences in communication, behaviour and social structure (Hofstede, 2003).

According to Ali (1988), Muslims believe that God is the greatest being. He created them and arranged all their life affairs. Moreover, Muslims believe that the future is best left to God. Therefore in doing their businesses, Muslims believe that they have to do their best and then success or failure is arranged by God (Akbar, 2003). This leads Leat and El-Kot (2007) to argue that individuals in Arabic culture consider hard work and keeping themselves busy as part of worshipping God and the way to relinquish sins, which is understood by Hofstede as part of uncertainty avoidance. According to Jandt (2004), in Arabic culture the religious expression "inshallah" means "if God wishes". This phrase is very common and used informally. Therefore, one should not think that you will be ignored if you ask someone to do something and he says "inshallah", especially when he says it twice, which means "yes" in Libyan culture. Communication in the place of work, as well as the social relations are important (Leat and El-Kot, 2007). Moreover, in the social atmosphere, harmony and maintaining relationships are the main characteristics of Arabic culture (Jackson, 2002). Therefore, cooperation for many individuals in this culture is a vital element in coexisting with others in society and in organisations (Hanky, 2004).

11 Cultural Values and Organisational Hierarchy

Nydell (1996) argue that, in Libya as in other Arab countries, organisations have faced various pressures from developed countries which have affected cultural values and how people behave in their workplace. In particular, the use of western technologies and approaches to work has necessitated the adoption of western values and social policies according to international standards. In terms of communication behaviour, people in higher distance cultures do care about face in work strategies when they express themselves and clarify their attitudes (Westwood et al, 1992). Therefore, in relation to facial expressions, in such cultures face in work communication strategies will be adopted according to the nature of the message. For instance, in delivering a negative message the sender uses an indirect communication style whereas direct face work strategies are used in delivering positive messages (Merkin, 2006).

In verbal communication in high context culture, as in the Libyan culture, people usually use fewer words in delivering messages, which is opposite in low context culture such as in America (Hofstede, 1997). Moreover, in Libyan society, large power distance cultures, formal and respectful behaviours are important in the organisational hierarchy to show differences between the leaders and other members. For instance, members of staff usually use formal title when they communicate with their leaders,

such as Mr, Dr, and Madam (Hofstede, 2001). This may be due to social tradition which encourages respect and obedience to parents and elderly people (Abouhidba, 2005). Therefore, an understanding of the national culture has a serious influence on how managers and employees communicate to make decisions and interpret their roles (Hanky, 2004).

In large power distance cultures, showing respect and obedience are very common among individuals. This may be because they do not value their own participation in decision making processes (Lee, 2005). Individuals accept unequal distribution of power in organisations and in society. This may lead to the use of powerful and formal language in organisational communication (Hofstede, 1997). Therefore, Peter (2007) argued that participation in the setting of goals and the decision making process are strongly dependent on communication and the relationship between employees and their leaders. However, due to cultural characteristics, managers in Libyan organisations consider the acceptance of advice, opinion or feedback from their subordinates as a negative sign to their way of running organisations. Therefore, in this society the feedback of qualified subordinates to advice or update their superiors is prohibited (Twati & Gammack, 2007). Consequently, this leads to central management and a central decision making process in Libyan organisations. In Libyan organisations, delegation is rare. Generally speaking, there is one owner or person in authority who is responsible for all those involved in the business and held responsible for all key decision-making. Personal relationships built on trust form the basis of all business practice in Libya.

12 Cultural Values and Harmony in Organisations

Gabb (2006) concluded that the cultural paradigm places people in the context of their cultural origins, which includes social, historical, psychological, political, knowledge, experience and other social factors. She argued that individuals in collectivist cultures tend to be more concerned about the importance of being members of a cohesive group. This may be to protect themselves socially in their peer groups in return for their loyalty and conformist social behaviour. On the other hand, this assumption is not encouraged by an individualistic culture that rewards individuals for their initiative and the risks they take to emphasis authority and express their theories and opinions (Hofstede, 2003). Therefore, in Libyan culture, as is the case in collectivist culture, it is really difficult for the staff to work according to organisational culture without being influenced by their cultural background. In other words, friendship and other social relationships have an influence on fulfilling tasks in Libyan organisations.

According to the Islamic religion, women are granted the ability to gain an education and to work. However, for political and social reasons, in the Islamic world and in Arabic countries in particular, women still have limited participation in leading public and private organisations (Donno and Russett, 2004). Thus, gender does have an influence on the communication behaviour of individuals in different social setting (Merkin, 2005). Johnson, et al. (2005) agreed with Burlesonn (2003), who found that women in employment were more concerned with establishing and maintaining good relationships and improving the work with their leaders. However, men usually do extra work in developing and maintaining their work relationships. This leads to the argument

that the religion of Islam has played an essential role in creating the cultural values of individuals in Libyan society. In Islamic culture, faith, ethics and social practices are strongly connected. Thus, Muslims usually consider Islam as their way of life (Abouhidba, 2005). Therefore, Dabbous-sensenig (2006) report that different aspects of the religion of Islam indicate how women should behave and dress within their homes and in workplace. This social structure and cultural background affects the relationship and communication within Libyan schools, universities, and organisations in terms of treatment towards one another and performance.

In general, the application of religion to social relations has a crucial role in increasing power distance, collectivism and masculinity in Libyan culture (Twati, 2006). For instance, obedience to parents and elderly people is strongly recommended in the Koran, being considered as a part of worshipping God, whereby believers will be rewarded (Abouhidba, 2005). This leads to a direct relationship between the organisational hierarchy and social culture in Libyan organisations (Twati & Gammack, 2007). Moreover, it is widely known that conforming behaviours and cooperation are strongly related to collectivism (Hofstede, 2001). This can also be seen in Libyan organisations, where managers care about their subordinates in different emotional and psychological situations (Twati &Gammack, 2004). These cultural dimensions strongly affect the communication behaviour of individuals in Libyan organisations, in addition to the social and organisational hierarchy structure in Libyan society.

13 Conclusion

From the literature review of the cultural studies, it can be concluded that Libyan culture is characterised by high power distance, masculinity, and uncertainty avoidance and low individualism. In this review, most of the studies cited here considered Arabic culture as a single culture. This may be because the Arab countries share certain common characteristics such as language, religion, customs, and other social features. In future research, the concept of Arabic culture should not be generalized to all Arabic societies, for several reasons. Firstly, Arab countries located in two different continents may have different political systems. Moreover, these countries have been occupied by various nations with different cultural background. Therefore, Arab countries need to be studied individually in a sort of case study.

In conclusion, Libya as a case has not been sufficiently researched, therefore, there is a necessity for more empirical studies to investigate cultural issues within the Libyan context. Research in the future should investigate the effect of organisational culture and leadership style on job satisfaction and organisational commitment and to examine to what extent organisational strategies aim to achieve matching between organisational values and national cultural values in order to encourage organisational change in terms of communication change among individuals in ruling organisations.

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The Influence of Culture, Organisational Structure and Motivational Constructs on Knowledge Sharing Public Sector Organisations

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Abstract:
Knowledge sharing is widely regarded as vital to organisational innovations. Knowledge itself is seen to provide real value when it is converted into economic and competitive advantage to organisations. In the same vein, organisational culture is considered to play a vital role in knowledge sharing initiatives. Culture can be argued to be rooted in an organization's core values and assumptions. Often these are not only unarticulated, but so taken for granted. They are therefore difficult to articulate and 'invisible' to organizational members. This paper, inter alia, explores the extent to which organisational structure and culture act as barriers to the successful implementation of knowledge sharing initiatives. Based on a critical review of extant literature, the paper purports to provide an insight, into the role that culture plays in effective knowledge sharing in the public sector. It also highlights the impact of motivational constructs in effective sharing of knowledge in the public sector. It concludes that culture, motivation and organisational structure impact on knowledge sharing in many complex ways. Organisations need to give due cognisance to these complexities when implementing knowledge sharing initiatives and in addressing the measures for assessing the success of a knowledge sharing initiative. These complexities also raise interesting issues for research in the area. These are discussed and documented for the benefits of researchers in the area.

Keywords:
Culture, knowledge sharing, motivation, organisational structure, public sector

1 Introduction

Kim and Lee (2005) define knowledge sharing capability as the ability of employees to share experience, expertise, values, contextual information, and insight for the purpose of creating frameworks for evaluating and incorporating new experiences and information. Knowledge sharing is now increasingly seen as important for organizational performance and effectiveness in public organizations. Beckman (1997) argued that knowledge sharing is one of the most important factors affecting

organizational agility and performance. Almeida (1996) emphasized that knowledge sharing also entails storage and retrieval mechanisms for quick and easy access to information that is used for adjusting strategic direction, problem solving, and improving organizational efficiency.

Nonaka and Takeuchi (1995) have since argued that organizations cannot create knowledge without individuals, and unless individual's knowledge is shared with other individuals and group. The Organization for Economic Co-operation and Development (OECD,2003) mentioned that ageing civil servants and staff turnover across countries have created new challenges for the preservation of institutional memory and the training of new staff. Furthermore, Remez (2001) emphasized this idea when discussing knowledge sharing in the public sector, especially in pointing out that over half of all federal workers in the United States will be eligible for retirement within the present decade, and that their knowledge and expertise must be replaced.

Employees are the main drivers of sharing knowledge and information in organizations (Nonaka 1994). Therefore, the biggest challenge in knowledge management is to ensure participation by employees in knowledge sharing, collaboration and reuse to achieve business result. In the public sector, this requires changing traditional mindsets and organizational culture from knowledge hoarding to knowledge sharing and creating an atmosphere of trust.

The importance of knowledge sharing has been emphasized in public administration along with the emerging discourse of network governance and network management. However, there has been little research pertaining to a systematic analysis of the organizational factors affecting knowledge sharing capabilities in the public sector, especially in Malaysia. The purpose of this paper is to contribute to a better understanding of this area through literature on how organizational structure, culture, and motivation influence knowledge sharing capabilities in public organizations.

2 Knowledge Sharing and organizational Capabilities

Knowledge is now being seen as most the important strategic resource in an organization and the management of this knowledge is considered critical to organizational success. Davenport and Prusak (1999) define knowledge as a fluid mix of framed expertise, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. Knowledge in the organization is not only embedded in the document or databases but also in the organizational routines, processes, practices and norms. One of the core necessities for knowledge creation, transfer and sharing is that employees contribute their knowledge or expertise to the company (DeTienne et al, 2004). Beside that, the initiation and implementation of organizational knowledge sharing practices should start with a top management value that sees knowledge as a source of competitive advantage (Bartlett & Ghoshal, 2002).

Usually, knowledge is shared in the public sector through the process of transformation of team's member situated understandings of their works. The creation of knowledge sharing capabilities in public sector requires dissemination of individual experiences

and collaboration between individual and between sub-systems in organization. As knowledge is a central resource of government service, effective knowledge sharing in the public sector is a significant public management challenge in providing excellence in public service. Improved knowledge management is essential to governmental agencies at the national, regional or local levels, because governmental organizations are basically knowledge-based organizations. Particularly, knowledge-sharing capabilities are considered key to the success of public organization to meet the needs and demands of constituencies in all levels of government. The creation of knowledge sharing capabilities in public organizations requires dissemination of individual employees' work-related experiences and collaboration between individuals and between subsystems of the organization. According Dyer (1997) collaboration with other agencies and stakeholders is the basis for improving knowledge sharing capabilities in the public sector.

Davenport & Klahr (1998) suggest that combining or integrating knowledge in different parts of the organization reduces redundancy, enhances consistent representation, and improves efficiency by eliminating excess volume. Besides that, the main benefit of knowledge management is to maximize productivity in the public sector, while enhancing public service delivery. . Similarly, Riege and Lindsay, (2006), identified that the objectives of knowledge initiative are to maximize efficiencies across all public services through connecting silos of information across different levels of government and across borders, develop new or consolidate outdated systems to improve overall performance and capitalize on a broader, more integrated and easier accessible knowledge base, improve accountability and mitigate risk by making informed decisions and resolve issues faster, supported by access to integrated, transparent information across all organizational boundaries and deliver better and more cost effective constituent services such as enhancing partnerships with and responsiveness to the public.

The discussion will further on the three organizational factors that influence knowledge sharing capabilities in the public sector: organizational culture, organizational structure and motivation.

2.1 Organizational Structure in Knowledge Sharing

Organizational structure defines the way in which the decision-making process occurs and determines accountability for material and human processes and resources. In the Malaysian public sector, organizational structures normally are based on hierarchical organisational structure. Creed and Miles (1996) noted that the hierarchical structure that marks many government organizations limits knowledge sharing activities and communication between employees or between employees and supervisors. Nonaka & Takeuchi (1995), suggested that this effect can also be achieved by maintaining the formal hierarchical structure while adding the dimension of flexibility. They indicated that a combination of a formal organizational structure and a non-hierarchical, self-organizing organizational structure would improve knowledge creation and sharing capabilities.

Another important variable related to organizational structure dimension in which this study is interested is why organizations are unable to effectively leverage knowledge.

Andersen and APQC (1996) have found “lack of commitment of top leadership to sharing organizational knowledge and the fact that there are too few role models who exhibit the desired behaviour” as negatively affecting knowledge sharing (Hiebeler, 1996). Davenport et al. (1998) have also identified senior management support and commitment as a knowledge management success factors and subsequently confirmed by Ryan and Prybutok (2001) who also proposed an open organizational culture. Therefore it’s essential to design organizational structure to promote and encourage knowledge sharing within organization

2.2 Organizational Culture in the Public Sector

Basically, organizational culture in the public sector is the personality of the organization. According to Schein (1992) organisational culture is a pattern of basic assumption about how the group copes with the outside world and about how members should act within the group. Three components of organizational culture receiving consistent attention with regard to the effectiveness of knowledge sharing include clear organizational vision and goals, trust (Kanter, Stein, & Jock, 1992) and social network (Leonard & Sensiper 1998). As a public sector seeks to more open, transparent and responsive, it has to improve its ability to engage the public effectively.

Interaction between individual in the organization is essential to create innovation process (Leonard and Sensiper, 1998). Dialogue between individual or group member is the basis for the process of creating knowledge or new knowledge (De Long and Fahey,2000) and can therefore be viewed as having the potential for creating knowledge. Nonaka(1994) has noted that knowledge is created and managed by individuals within organizations. Thus, interaction between them should be encouraged so the relationships, contacts and perspectives are shared. To overcome these, all members in the organization need to be clear about organizational vision and goals. Leonard (1995) identified that vision that permeates the organization can provide people with a needed sense of purpose that transcends everyday activities. With clear vision and goals, all members in the organization know their way or the organization itself.

Developing a high level of trust is a precondition for developing a collaborative culture. Von Krogh (1998) suggests that trust and openness in organizational culture promote employees’ active knowledge management behaviours. Ardichvili et. al. (2003) has divided trust into two; trust in the other or personal knowledge-base trust and trust in the organization or institution-based trust as whole. In order to develop trust in organizations, management have to form an organization’s social interaction culture. It provides an opportunity for individual to interact and be understanding of each other and hence develop the degree of trust among team members. According to Cohen and Prusak (2001), high level of employee trust can lead to better knowledge sharing, shared goals, and lower transaction costs. To achieve best possible gain in developing trust, a social environment can be created within an organization in the public sector.

O'Dell & Grayson (1998) indicate that social network through communications, dialogue, and interaction between individuals or groups is important to support and to encourage employees’ knowledge-related activities. Especially, formal and informal relationships and contacts are important for sharing different perspectives and

knowledge in organizations (O'Dell & Grayson, 1998). Normally, formal relationship such as training programs or structured work teams can facilitate the sharing of knowledge. On other hand, one of the mechanisms to support informal knowledge sharing in public sector is through communities of practice. Gray (2004) identified community of practice to consist of individuals with a shared domain of expertise who voluntarily shares knowledge about practices that matter to them.

2.3 Motivation

Motivation is one of the important variables related to knowledge sharing dimension. According to Marslow (1954) an individual is ready to act upon the growth needs if and only if the deficiency needs are met. Incentive is one of the methods of optimizing employees' performance. Reward such as money and recognising system are way to motivate people to share knowledge. However, other factors for example self development, contributing to the nation and harmonious relationship are also important. This is because individuals in public sector understand that in exchange for their effort and commitment, the organization will help to develop their potential.

2.4 Knowledge Sharing Barriers in the Public Sector

The employees are arguable generally very collaborative and obedient. Identification and recognition of knowledge sharing barriers, rather or not these are a natural part of an organization's culture, play an important role in success of knowledge management strategy. Riege (2005) noted that knowledge sharing practice often seems to fail because companies attempt to adjust their organizational culture to fit their knowledge management programs, instead of implementing these programs to fit their culture. Knowledge management initiatives should be integrated into public sector activities, inseparable from strategy, planning and implementation or communication.

2.4.1 Individual Factor

The distribution of the right knowledge from the right people to the right people at the right time is arguable one of the biggest challenges in knowledge sharing. As mentioned earlier, individuals are key player in knowledge sharing process. There are various reasons why people hoard their knowledge and the contexts are often multi-dimensional. At the individual level, barriers are various and this review has identified the importance to overcome barriers to sharing knowledge. 1. Lack of time: Time restrictions are also a reason why people may potentially hoard their knowledge rather than spend time to share knowledge with others. Instead, people naturally focus on those tasks that are more beneficial to them (Michailova and Husted, 2003). 2. Apprehension of fear that sharing may reduce or jeopardise people's job security: Even today, there often is a fear amongst employees that sharing knowledge reduces job security because people are uncertain about the sharing objectives and intent of their senior management (Lelic, 2001). 3. Lack of social network: Kanter (2001), observed that organisations that develop networks both internal and external to their organisation are supposed to be able to deal with knowledge more effectively. 4. Lack of trust: Most people are unlikely to share their knowledge without a feeling of trust. Kane et al. (2005) argue that in-group members tend to be more influential than out-group members because they are perceived in more positive terms (trustworthy, honest, and loyal) which eventually may also affect knowledge sharing in a negative way. 5. Differences

in ethnic background: The composition and diversity of the Malaysian workforce in the public sector has brought different cultural values and leadership styles to organizations in Malaysia. They have their own culture, value and beliefs. According to Sackmann and Friesl (2007), cultural differences were operationalized in terms of different kinds of culture rules and realized in different ways of thinking and acting.

2.4.2 Organizational Factor

One of the other key issues of sharing knowledge in public sector is related to the right organizational environment and conditions. The introductory discussion suggested that there are various ways of sharing individual and social or organisational knowledge effectively.

1. Missing or unclear knowledge management strategy in organization's goals: Most of public sector agency performs several tasks. The success or failure of a knowledge sharing strategy is dependent on its integration into the goals and strategy of the organisation (Hansen et al., (1999). Therefore, It is the responsibility of top management to communicate those goals and strategies to all employees in a transparent fashion to obtain support. Pemberton, et al., (2002) claims leadership is responsible for creating the knowledge vision of the organization, communicating that vision, and building a culture that regards knowledge as a vital company resource. However, all too often, this communication and managerial directions are either too vague or detailed and not providing a clear picture and guideline to employees.

2. Lack of leadership: The challenge to managers is to create an environment in which people both want to share what they know and make use of what others know. A lack of managerial direction and leadership can limit knowledge sharing practices. People cannot always be expected to share their knowledge and insights simply because it is the right thing to do. Salleh & Goh (2002) insisted that top management leadership and commitment are the most critical factors for successful knowledge management. Since knowledge sharing is effectively voluntary and conscious sharing is a new behaviour to learn for some people that may require training and ongoing support, clear guidelines seem to be an obvious prerequisite for effective sharing on all organizational levels (Ives et al., 2000).

3. Lack of a transparent rewards and recognition systems that would motivate people to share more of their knowledge: Stemming from the competitive instincts of human nature, incentives are one method of optimising employee performance and corporate results. Khaliq (2001) identify reward systems such as 'paid leave' are more effective for Malaysian companies. In addition, Michailova and Husted (2003) argued that the use of encouragement, stimulation or incentives is inadequate in hostile sharing environments, suggesting that any kind of rewards evaporate quickly and do not increase motivation for knowledge sharing.

4. Shortage of appropriate infrastructure supporting sharing practices-Providing an appropriate infrastructure and sufficient resources to facilitate sharing practices within and between functional areas is the basis of a successful knowledge management program (Schlegelmilch and Chini, 2003), but sharing practices are often doomed to fail

before they begin due to the absence of basic infrastructure and sharing capabilities (Gold et al., 2001).

5. Deficiency of company resources that would provide adequate sharing opportunities- Organisations also grow and evolve with time and as a result some processes and structures that were integrated successfully to serve a certain purpose in the past become obsolete due to their inefficiencies. Davenport (1996) emphasised the importance of financial commitment to KM practices, which in many cases can be expensive. Hence, adequate resources to support knowledge flows and collaboration need to be allocated.

6. Communication and knowledge flows are restricted in certain directions- Consider for instance changes through internal growth, mergers or acquisitions, all of which can pose a threat to effective sharing of individual and organisational knowledge. Irrespective of a company's formal structure, knowledge sharing seems less likely to occur in highly structured, multi-layered, and hierarchical organisations and the usually corresponding top-down communication flow. Whereas in relatively flat organisations, with communication flows that are not restricted in one direction (usually centring around small functional areas, business units or project teams), knowledge sharing is more likely to occur (Ives et al., 2000).

7. Physical work environment and layout of work areas restrict effective sharing practices-Another barrier that is often overlooked relates to floor layout or spatial arrangements of work areas that commonly do not favour knowledge-sharing activities. Traditionally, offices and even departments tend to be arranged along hierarchies or management seniority rather than focusing on who needs to work together regularly and identifying which person benefits the most from the exchange of knowledge (Probst et al., 2000). A well designed and safe working environment will enable better use to be made of employee's abilities and will most cases help to provide satisfaction of human needs (Krogh, 2000). Comfortable working environment relates closely to cleanliness which should be stress on by the management. The physical office space layout, design and configuration will encourage employee interactions; which in turn enhance employee's willingness to learn and share knowledge with others.

3 Research Methodology

This research is part of an-ongoing PhD study which is entitled "Knowledge Sharing initiatives in Malaysian Government Agencies". This paper is primarily based on a thorough review of relevant literature in the areas of knowledge sharing, culture, motivation and organization structure within a public sector perspective. Literature review is a clear and logical presentation of the relevant research work done thus far in the area of investigation (Uma Sekaran, 2006). The research methodology for the study has not been finalised. However, it is envisaged that a pilot would be conducted utilising a semi structured interviews involving 5 public agencies in Malaysia. Pilot study is a small scale replica and a rehearsal of the main study (Sarantakos, 2005). A pilot study provides an opportunity to test out some objectives, research questions, and to explore methods (Yin, 1994), allowing any changes or amendments to be made before the main study is conducted. On the strength of the finding of the pilot study, and a more through review of extent literature, the methodology for the main study would be developed.

The articles reviewed in this paper have come from journals, conference proceedings and websites. In structuring the literature review, only papers written between 1992 and 2008 have been analysed. This because this cohort of year only has been recognised has the relevant items for this research.

4 Conclusion and Further Research

This paper focused on the influence of organisational structure, culture and motivational constructs on knowledge sharing in public sector organisations. From the review, these factors were found to have significant impact on knowledge sharing in public sector but knowledge sharing has no real value to individuals and organizations unless those people, who are in need of useful knowledge receive it, accept it and also (re-)apply it.

It is highly recommended that managers bear in mind the existence of the factors which may impact knowledge sharing. Also, it is important to recognize the uniqueness of public sector organization's culture in removing obstacles to knowledge sharing. Hence, the most appropriate option for a given organization would be to investigate potential problems that may exist in its own culture, structure and motivational needs and accordingly suggest the proper solutions. Success in knowledge management is about the identification of knowledge sharing barriers and the gap between the ideal and current state of sharing practices. It is also about making sure that appropriate values are in place and actually practiced. The next stages of this ongoing study involve developing a conceptual framework and conducting a pilot study. Findings from the study should positively inform the proposed main study.

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Women's Career Advancement in the UK Construction Industry

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Abstract:
The redressing the gender imbalance in the UK construction industry has been emphasised on numerous occasions and many researchers have identified that women can contribute in a big way towards the construction industry development. However, construction industry has failed to attract and retain women who are interested in a construction career. Participation of women is still very low in some parts of the industry, in particular, at a time when skilled people at all levels of the industry are in demand. Therefore, research is in need to look at what could be done to encourage women to seek careers and retain in the industry.Even though numerous research studies have been conducted into how to attract and retain women into construction, the desired effect hasn't yet been seen. Several hindrances have been identified which hinder women's career advancement in the UK construction industry. Lack of training and development of management skills are identified as significant barriers for them to develop their career within the industry. In this context, this paper evaluates the need of different training and development initiatives in different career stages to advance women's career within the construction industry.

Keywords:
Career advancement, Construction industry, Training and Development, Women

1 Introduction

The UK construction industry is suffering from a skill shortage both in professional and craft level. In 2005, 2.41 million people were employed in UK construction industry and that figure is expected to rise to more than 2.8 million by 2011(CITB-Construction Skills,2007).Over these seven years (2005-2011), this represents an employment increase of 17.5%. To deliver this growth and replace those who will leave the industry over the period, an average of 87,600 new workers will need to be recruited per year, a slightly higher number than estimated over the 2006-2010 period (CITB-Construction Skills,2007).There is a significant requirement for professionals and managers to enter the UK Construction industry (CITB-Construction Skills,2007).Over 32% of the

recruits forecast for the next five years are needed to fill roles as construction managers, architects and technical staff, or as senior executives, business process managers or office based and technical/IT recruits (CITB-Construction Skills, 2007).

Practitioners and researchers have suggested numerous ways to address the shortage of skilled workers(Menches and Abraham, 2007). Among the most promising solutions are higher wages, increased training, improvements in productivity, implementation of technology tools, innovative recruitment techniques, and an increased commitment to diversity(Menches and Abraham, 2007). According to Gurjao (2006) UK construction industry is facing recruitment problems with its traditional source of labour-young men aged 16-19. The constant reliance on a limited recruitment base disadvantages the industry by disregarding half the population and the diversity of skills these people have to offer. By restricting the possible workforce, the industry is limiting the choice of applicants at its disposal, which in turn may lead the recruitment of lower quality employers. Indeed, it is said that a major obstacle to the industry to recruit the best people is the fact that half of the population is largely ignored by the industry (Green, 2005). Therefore, It is assumed that a greater number of women will be a clear sign to reduce the skills gap and labour shortage in the industry and to increase the equal opportunities policies working (Greed, 2006). Thus, a logical solution to increase the number of women in the industrial professions is attracting more women to the industry initially and then subsequently increasing the retention of them (Gilbert and Walker, 2001). Hence, both recruitment and retention is equally precious to raise the number of women.

How can we explain the continuing poor representation of women in management positions in construction? Even with the progress we have observed in the representation of women in management roles, the numbers are still inexplicably low. Women represent 10% of total work force in the construction industry (ONS, 2008), professional women make up only 1% of the 10% and all other women hold administrative positions (CITB, 2003).In an attempt to account for this low representation of women in management roles, previous research considered the possibility that career obstacles were experienced by women advancing in their management careers (Davidson and Cooper, 1992; Bass and Aviolo, 1997). Considering the changes to the construction labour market and the advances that women have made in improving their representation, there is now a need to gain a detailed understanding of what the precise nature of the barriers are to women's careers that can lead to their under-achievement (Dainty *et al*., 2000). By considering previous studies, it can be highlighted that the lack of Training and Development (T&D) is one of the barriers to women's retention in the industry (Sommerville *et al*., 1993; Dainty *et al*., 2000; Feilden *et al*., 2001; Link, 2006). Women and employers believe there is a need for funded government / employer training programmes to ensure adequate re-training that fits in with childcare responsibilities (Turgoose *et al*.,2006).Consequently, women are increasingly concerned about receiving adequate training particularly for non-traditional jobs (Turgoose *et al*., 2006). In this context; the aim of this paper is to evaluate the need to have different T&D initiatives in different career stages to advance their career within the construction industry.

Accordingly, this paper presents a review of literature on the need of T&D to advance women's career in the construction industry. First, the paper discusses women's career

advancement with particular referring to women's career development phases. This is followed by a discussion on T&D and women's career advancement within construction industry. The study is focused on women, who work within the professional capacity in the UK construction industry. Women in professional capacity include women managers and professionals in the industry (mainly involve in managerial activities). Women hold the following positions such as: supervisory role, middle management role and senior management roles which includes professions such as: Quantity Surveyors, Engineers, Construction Managers and Building Designers.

2 Women's Career Advancement

2.1 What is Career Advancement?

A career is broadly defined as a lifelong process of work-related activities that includes both objective and subjective aspects (Hall, 2002). Career advancement is defined as an on-going series of stages characterised by unique concerns, themes and tasks (Greenhaus *et al*., 2000). Classic age/stage models of career advancement have been instrumental in laying a foundation that has shaped career theory over the years (Schein, 1978; Super, 1980). According to Van Maanen and Schein (1977, p. 36), career development is "a lifelong process of working out a synthesis between individual interests and the opportunities (or limitations) present in the external work-related environment, so that both individual and environmental objectives are fulfilled". Historically, the objectives of individuals have been expected to conform to those of the environment - specifically those of employing organisations (Hall and Mirvis, 1995). The result was traditional "organisational" careers that were externally-oriented, emphasising vertical progression through positions carrying increasing responsibility, status, and rewards defined by the organisation (Hall and Mirvis, 1995). The traditional career contract between workers and employers seems to be shifting, however, to a protean career model based on "self-direction in the pursuit of psychological success in one's work" (Hall and Mirvis, 1995, p. 271). Protean careers are internally-oriented, flexible, mobile, and may involve both horizontal and vertical growth in the pursuit of goals defined by individual workers (Hall and Mirvis, 1995; Sullivan, 1999). Tharenou (1997) concluded that "individual qualities and work environment factors combine to facilitate individuals entering and advancing in management in hierarchical organisations" (p.84).Individual traits were found to be important in career advancement, both initially, and in the long term. Individuals who advanced in their careers were described as ambitious, advancement and career motivated, capable of self monitoring, with high achievement needs and work involvement, high levels of motivation to manage, intelligence and "suited to the task demands of managerial jobs" (Tharenou 1997, p. 83). In addition to individual's traits, human capital investments and managerial skills were important in obtaining promotion and interpersonal hierarchical support was found to be more beneficial to male managers (Tharenou, 1997).

By synthesising the above, women's career advancement can be defined as the individual qualities and work environment factors combine to facilitate individuals entering and climbing up in the career ladder in hierarchical organisations. Within this premise, section below discusses the women's career advancement phases.

2.2 Women's Career Advancement Phases

Three critical factors could be identified in making a compelling case for treating women's careers as entities worthy of focused investigation in and of them.

1. Different impact of family responsibilities on men's and women's career (Burk, 2002);

2. Findings from women's developmental psychology (Kram, 1996); and

3. Women are relative under- representation and subsequent token status at higher organizational level (Ely, 1995).

Astin (1984) proposed the career enhancement theory should describe women's career separately from men's careers. Her model of career development is based upon four constructs which she believes shape women's career development. They are; work motivation, work expectations, sex-role socialisation and structure of opportunity which includes factors such as sex-role stereotyping, distribution of jobs and discrimination. Whilst, Larwood and Gutek (1987) concluded that any theory of women's career development must take account of five factors:

1. Career preparation, or how women are brought up to view the idea of a career and whether they believe they will have one or not.

2. Availability of opportunities should be taken into consideration, and whether they are limited for women, compared with men.

3. Marriage, viewed as neutral for men but harmful to the career of women.

4. Similarly, pregnancy and having children inevitably cause women to take some kind of career break.

5. Timing and age, as career breaks and family relocations often mean that women's careers do not follow the same chronological patterns as those of men.

Powel and Mainiero (1992) claimed that women have two overriding concerns in their lives, for their career and for others (e.g. family and friends). Their model therefore, incorporates the influence of personal, organisational and societal factors to describe the balance between work and non-work aspects of life which most women strive to achieve.

O'Neil & Bilimoria (2005) researched on how women's careers develop over time, particularly with regard to the impact of career contexts (societal, organisational, and relational) and women's own changing images of their careers and career success. They proposed a three-phase, age-linked model of women's career development phases these are:

1. The idealistic achievement phase(Phase 1)

2. The pragmatic endurance phase(Phase 2)

3. The reinventive contribution phase (Phase 3)

The driving force of phase 1, early career (ages 24-35), is idealistic achievement. Women in the idealistic achievement phase will most likely base their career choices on their desires for career satisfaction, achievement and success, and their desires to positively impact others.

The driving force of phase 2, mid-career (ages 36-45), is pragmatic endurance. Women in this phase are pragmatic about their careers and are operating in production mode, doing what it takes to get it done.

The driving force of phase 3, advanced career (ages 46-60) is reinventive contribution. The women in this phase are focused on contributing to their organizations, their families and their communities. They are most likely to attribute others, personally and professionally, as having had input into the direction of their careers (external career locus) and are likely to reflect a stable, planned career path (ordered career pattern).

O'Neil and Bilimoria, (2005) career development phases have been taken as the basis for this study in order to categorise the different stages of women's career development phases. The following section discusses how T&D could advance women's career within the construction industry.

3 Training and Development (T&D) in the Construction Industry

Training is generally defined as a planned and systematic effort to modify or develop knowledge, skills and attitudes through learning experiences, to achieve effective performance in an activity or a range of activities (Garavan *et al*., 1995; Harrison, 1993; Reid *et al*., 1997). Development is defined as broader capability to take up future work and career opportunities, beyond the competencies required for a current position (Collett, 1998).

Dainty *et al.* (2004) have identified that addressing skills needs in the long-term requires the region's employers to buy-in to the training process. Conversely, they emphasised that employers felt that the industry's funding and training infrastructure are overly rigid and do not meet the needs of the types of people entering the industry (Dainty *et al.*, 2004). Dainty *et al*. (2004) identified in his interviewees that training was always very much part of the culture in organisation and it helps to increase productivity and reduce in-house labour turn over. Similarly, Berge *et al.* (2002) argued that the field of training and development has undergone changes that reflect the dynamic factors in the corporate world overall. T&D's objectives continue to shift from a focus on programmed instruction (and behavioral and task analysis), to performance-system analysis.

Data from the Learning and Training at Work survey of employers (2003) identified how training in construction compares with training in other sectors. Table 1 shows the percentage of employers providing off-the-job training in 2002.

Table 1: Percentage of employers providing off-the-job training in 2002 (Source: Learning and Training at Work 2002)

Industry Sector	%
Construction	64
Construction < 200 employees	64
Manufacturing	56
Agriculture, mining, utilities, construction	63
Distribution & consumer services	49
Finance & business services	63
Transport, public administration and other services	80

The proportion of employers providing off-the-job training in 2002 in construction was relatively high at 64%. Construction had the second highest percentage of employers providing training.

The Employment Skills Sub Group of the Kirklees Learning Partnership (2004) (which involved a survey of over 180 firms with employees) was carried out to gain insight into the rationale used by local firms in deciding whether or not to invest in training and to explore how they interpret and relate to the "Learning Pays" message. The research revealed high levels of training activity but less evidence that the activity was linked to the strategic aims of the business. Most firms agreed that training and development were essential to the success of their firm. However, less than a quarter thought a lack of trained staff had an effect on their competitiveness, or that their ability to train was affected by a lack of local provision. More than 80% of respondents had invested in training and had a member of staff responsible for training and development, although less than half had a training plan. The main reasons given for not training were "no need"; "cost" and "workload". Very few companies with a training plan did not train. Companies with no training plan based their decision to train on appraisals, interviews, site checks, the requirements of legislation and experience.

Health and Safety and IT were the most common types of training offered, and most of those receiving training were skilled and semi- skilled site workers. The following Figure 1 revealed the types of training organisations engaged in the industry as per The Employment Skills Sub Group of the Kirklees Learning Partnership (2004).

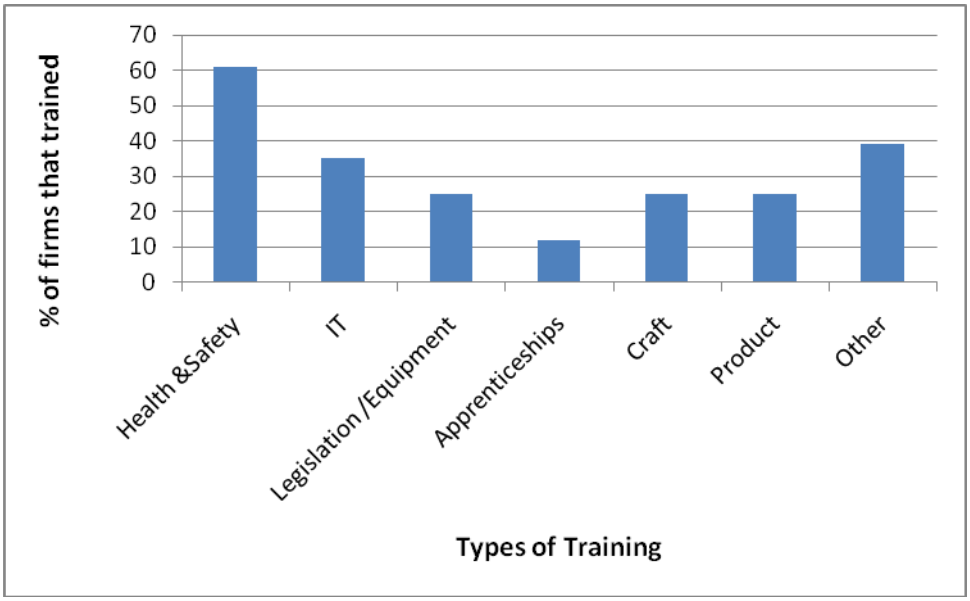

Figure 1: Types of T&D offered by the organisations
(Source: Employment Skills Sub Group of the Kirklees Learning Partnership, 2004)

3.1 T&D for Women's Career Advancement

CITB has also been involved in a range of projects that seek not just to bring young people into the sector, but also to identify and facilitate projects that can act as learning vehicles (Miller *et al*., 2004). The Women Building London campaign, Women in the Built Environment (WITBE), Oxford Women's Training Scheme, and Women and Manual Trades can be identified as those vehicles in the construction industry that provide a guide to women entering into construction. However, those projects were mainly concerned about the recruitment rather than the retention of women in the industry. Women returnees' strategy for the UK Resource centre (UKRC) for women in SET(Science Engineering and Technology).UKRC can be identified as the one of the initiatives which provides better conditions for qualified women to return to SET careers. Provisions of advice, mentoring and networking, training and flexible work placements are provided by the women's strategy for the UKRC to return women in the SET occupations. The CITB has developed a three point plan to encourage more women into construction under its diversity strategy initiative. Through education, school children have been given the opportunity to sample the construction industry through class projects. Positive Image campaigning was aimed at attracting men and women into the industry by highlighting the positive aspects of a construction career. Finally, by continuing to support employers, there have been increased targets for apprenticeships and local regeneration projects have encouraged clients to seek out more women applicants for vacancies (Yuill, 2005). Although the above mentioned initiatives have taken place to introduce T&D for construction professionals, the desired effect has yet to be seen in the industry. Thus, the following section identifies the barriers women face when receiving T&D.

3.1.1 Barriers faced by women in Training and Development

Although women's experiences differed, there is compelling evidence of the range of obstacles and challenges faced in entering training and employment. Elvitigala *et al*.

(2006) identified the obstacles women face, when receiving T&D in the construction industry. Women who have succeeded in non-traditional skill areas are particularly resilient and determined. According to Fielden *et al.*,(2000) there is attitude had persisted through training into the workplace, where women had been expected to undertake clerical and support duties and had to fight to be given technician training and work. Therefore, women had experienced disadvantages during their training because of their gender, and this was the case in their subsequent careers (Fielden *et al.*, 2000). Further, according to Angela *et al*. (2005) there are numerous obstacles which are faced by women:

1. Women had not been given appropriate advice and guidance in subject choices for non-traditional route ways, nor when older in relation to training provision.
2. Some women encountered resistance to them undertaking non-traditional skills training from their husbands or partners. Success in a male domain, coupled with the fact that they could earn more money than their partner triggered resentment.
3. Women found it much harder than their male counterparts to secure work experience placements with employers in order to complete their NVQ qualifications.
4. In mainstream training women experienced isolation as the 'only one' on many courses, with no female lecturers, inflexible hours and little support. These conditions meant that only the strongest and most determined women completed the courses.
5. As many of the women entered non-traditional training when older, they had not been eligible to take part in Modern Apprenticeships. Funding to employers for training is focused upon Modern Apprenticeships; therefore the options for women were limited by age and gender.
6. Women in training and employment faced overt and covert discrimination from employers. In some cases employers refused to train or employ women. In other cases women were laughed at, bullied, faced antagonism, were given the worst jobs to do and were expected to make the tea.

In the context of a highly segregated labour market and the obstacles that women continue to face, it is unrealistic to expect that numbers will significantly increase unless particular actions are instituted. It is not reasonable to expect women to be unusually resilient and determined in order to survive in training or work. It seems that particular attention and positive action is required to meet the needs of women entering training and employment and a national policy needs to be developed.

T&D could be successfully achieved through collaboration between major organisations and stakeholders. Thus, this literature leads towards the identification of need of T&D towards women's careers advancement in construction. Accordingly, the following section describe the research methodology adopted for this study leading towards justification of need of different T&D activities in different career phases.

4 Research Methodology

The aim of the study is to evaluate the need of different training and development initiatives in women's career advancement within the construction industry. The study

is mainly based on a comprehensive review of literature and is structured around the following two areas: First, the paper discusses women's career advancement with particular reference to definitions. Subsequently, it leads towards the identification of women's career development phases. The second section of the paper discussed the T&D in the construction industry. It identified current status of T&D in the construction industry, female specific T&D programme and their success and barriers women face when receiving T&D. Finally, the paper justifies the need of different T&D activities in different career phases for women's career advancement.

5 Need of T&D to Women's Career Advancement

Literature findings summarise that women are seeking to gain more T&D in order to advance their career within the construction industry. As Dowling *et al*. (1999) contented that training aims to improve current work skills and behaviour, whereas development aims to increase abilities in relation to some future position or job, usually a managerial one. Therefore, it clearly indicated that being engage in training and development activities will help them to achieve their future career advancement goals. According to O'Neil and Bilimoria (2005) women have three different career phases such as idealistic achievement phase, pragmatic endurance phase and reinventive contribution phase. The particular career development model has three different career objectives and career goals. Therefore, when addressing the issue of T&D activities needs to be considered their career phase and the objectives of the particular career phase (Fernando *et al.*, 2008). This emphasises that the, same training and development activities may not suit for women mangers in different career phase due to the differences in their career objectives (Fernando *et al*.,2008).

Burke and McKeen (1994) highlighted that managerial women who participated in a greater number of education and training activities are more organisationally committed, job-satisfied and involved, and have higher career prospects. Therefore, education and training seem to be of great importance to the career development of women managers (wentiling, 2003). Nichols (1994) noted that women must rely on themselves rather than on institutions to create careers. They must make their own career opportunities by pursuing training and experiences that can be applied anywhere. Similarly, Flanders (1994) noted that the responsibility for ensuring adequate training can't be left solely to the employer. To be successful, women must take personal responsibility for ensuring that they receive the training required to progress in their careers (Wentling, 2003). Women themselves may often need to take the initiative to request the training they need in order to continue advancing in their careers (Wentling, 2003). Therefore, the identification of required T&D activities according to their career phase will be both employer and employee responsibility. Further, Burke *et al*. (2006) have highlighted that education, training and development can be conceived of as being either or both challenge and support. To the extent that they may provide technical training, coaching and key assignments they represent challenge and a chance to improve/prove oneself. To the extent that they may involve training geared to women, for example, assisting women with issues unique to being women in male-dominated organisations or industries, or providing mentoring, they could be viewed as support activities. Some activities, for example, mentoring, clearly involve aspects of challenge and support.

6 Conclusion and the Way Forward

Attracting and retaining more women into construction has become a necessity to heal the industry from suffering a severe skill shortage. It fulfils the requirements of equal opportunities in the industry and the need for diversity in construction. When finding the reasons behind low representation of women in senior roles within the construction industry, the literature considered that the possibilities of career obstacles were experienced by women advancing in their management careers. Therefore, it is necessary to understand the precise nature of the career advancement obstacles which, can lead to their under-achievement. Lack of training and development activities can be identified as the one of the career obstacles to advance their career within the industry. Though, numerous initiatives have been formulated to advance women's career through training and development initiatives, successful effect hasn't as yet been seen in the industry. One of the reasons for lack of successfulness will be, those initiatives are not considering the women's career phases and the career objectives in each phase. Therefore, it is necessary to consider the different career phases and accordingly providing necessary T&D would advance the women's career in the industry. Consequently, this paper has identified the need of different T&D in different career phase to advance women's career within the construction industry.

By having identified the need of T&D to women's career advancement, this study leads towards the identification of existing body of knowledge on different T&D frameworks which are prepared for career advancement in the construction industry.

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Analysing leadership styles of female managers in UK construction: the research techniques

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Abstract:
UK construction industry faces challenges in meeting skill and labour shortages. Amongst other reasons, gender segregation has led the industry being unable to benefit from the diverse skills that women can offer. Among such skills is leadership. Therefore, a research focusing on the contribution of leadership styles exhibited by construction female managers towards the industry development is currently undertaken. This paper presents the research methodology that has been adopted to this research. Justifications are made for the appropriate choice of methodology in terms of its philosophy, strategy and techniques. Focus has been given on the research techniques used for data collection and data analysis. Accordingly, the techniques namely Multifactor Leadership Questionnaire (MLQ), Personal Attribute Questionnaire (PAQ), Semi-structured and Expert interviews are elaborated followed by an illustration on the research process and techniques.

Keywords:
Female managers, Leadership styles, Research techniques, UK construction.

1 Introduction

This paper presents the research methodology used to analyse the leadership styles of construction female managers in UK. It begins with the background where a picture of UK construction industry is given, including the demand and challenges that the industry faces. The aim of the study is then explained. The research methodology of this research, which is the primary focus of this paper, is presented next. The research techniques used for the data collection and data analysis are discussed in detail. The paper concludes with an illustration on how the combination of research techniques can be used to approach the aim of the study.

1.1 Background

Construction in United Kingdom (UK) is one of the pillars of its economy. The demand for construction continues to increase in UK. Construction output is predicted to grow by around 11% by 2011, led by a surge in the buildings of schools, ambitious housing

targets and developments for the London Olympics (CIOB, 2008). The construction industry is not a single body but a collaboration of many stakeholders from various disciplines providing employment to various professionals and workers at different levels. Thus, it involves multi-tasking activities and multi-disciplinary personnel. Increased demand of construction therefore will also increase the demand for construction personnel. In order to meet this demand, nearly 88,000 people were reported to be required annually to add to the existing workforce of the industry (Construction Skills, 2007). However, the current economic climate challenges the industry to fulfill this requirement. A recent report by Construction Skills (2008) revealed that the slowdown in the housing markets and related sectors has reduced the annual requirement of the new construction from the previous average of 88,000 per annum to 42,000 per annum between the years 2009 and 2013. However, despite fears in some sectors of the market, the industry will continue to grow over next few years. Between 2009 and 2013 construction is expected to expand by 0.7% annually, especially due to the projects like Olympic Park, Thames Gateway re-development, and continued public sector investment in services and facilities such as roads, schools and hospitals (Construction Skills, 2008).

The industry has also changed significantly over the past decade with new forms of procurement, partnering arrangement, increased use of design and build with more integration between design and production, more specialisation and a new culture of health and safety (Gurjao, 2008). If this situation continues, the industry can expect a collaborative environment in construction, reducing the fragmented nature, in the long run. Increased need of labour and the dynamic nature of the construction industry demand a workforce to meet industry's requirements both in terms of numbers and skills.

Further, the industry is suffering from skills shortages, resulting in a threat to the healthy production of construction output, and in turn, its business performance. The shortage of people with the technical and managerial skills to fully utilise the new technologies has been a problem for many years in the construction industry (Egan, 1998; Whittock, 2002; Construction Skills, 2007). A recent report by CIOB (2008) revealed that the skills shortages and difficulty of recruiting workers are severe at crafts/trades level closely followed by senior and middle management levels. This skill and labour shortage can be a threat to the long term growth of the industry and it may also challenge the industry's capability to deliver the projects on time, within the budget and at the desired quality.

The industry also faces recruitment problems with its traditional source of labour – young men aged 16-19 (Gurjao, 2008). The constant reliance on a limited recruitment base, disadvantages the industry by disregarding half the population and the diversity of skills these people have to offer. By restricting the possible workforce, the industry is limiting the choice of applicants, which in turn may lead to the recruitment of lower quality employees. Construction employers recruit and rely increasingly on workers from overseas, either inside or outside the European Economic Area (EEA), giving rise to immigration issues with an increasingly diverse force (Gurjao, 2006). However, a recent survey by CIOB (2008) revealed that the migrant workers are not common as senior and middle managers in UK construction. Even if migrant workers hold

managerial skills they are often not recruited due to poor English language competence (CIOB, 2008).

In addition to the recruitment problems and increased demand for construction, gender segregation is another factor which contributes to the skills shortages in the industry. Gender segregation of the construction industry indicates that the concentration of men and women in different kinds of jobs conform to societal expectations of the gender (EOC Press Releases, 2004). Women are more likely to work in administrative and secretarial, personal services and sales occupations, whereas men predominate in skilled trades occupations, process, plant and machine operative occupations and managerial occupations (Hibbett, 2003). A change in this gender segregation pattern will be one of the ways to resolve the skills shortages of the construction industry as it could bring in a workforce with diverse skills and talents. This can be done by increasing the number of women managers working in the industry. As per the CITB (2003), women account for 9% of the construction workforce, of which 84% hold secretarial posts, 10% are employed in a professional capacity in design and management areas, and the rest are attached to craft and trade level employees. These figures almost remain static. Increased number of female managers will make a change on this composition of females within the construction industry and will also contribute to reduce the skills gap.

Growing presence of women in managerial workforce continues to motivate research on the leadership styles of women, particularly to determine if women have their own ways of leading. Organisations have paid attention to the leadership styles of the people who occupy managerial positions, holding the belief that leadership is an important factor in achieving business success (Giritli and Oraz, 2004). As raised by Egan (1998), shortage of people at the top management level with the commitment to being best in class and with the right balance of technical and leadership skills to manage their business accordingly has been a major issue. The real issue in leadership differences lies in the equity in selecting the right person with the appropriate skills and qualities to ensure the effectiveness and success of the organisation (Bass and Avolio, 1994). Stevens (2007) proposes a leader-manager model as the effective one for construction. He believes the leader-manager skill is the new driver in the construction industry, as the reality of the construction industry demands we have dual roles. In view of that, the contribution of female managers can hardly be studied without considering the leadership component.

1.2 Aim of the research

As explained above, UK construction industry faces challenges in terms of recruitment of skilled workforce to the industry. One possible solution to reduce the skills gap would be to increase the number of female managers, who are currently under-represented in construction industry. Although there are several research efforts conducted on women managers in construction, there is dearth of research focusing especially on the contribution of leadership styles exhibited by female managers in construction. Therefore, this research aims to explore and investigate the contribution of leadership styles of female managers towards the construction industry development. In this context, next section broadly explains the research methodology adapted to this study and the data collection and data analysis techniques in specific, which forms the basis of this paper.

2 Research Methodology

Research methodology refers to the overall approach to a problem which could be put into practice in a research process, from the theoretical underpinning to the collection and analysis of data (Collis and Hussey, 2003; Remenyi et al., 2003). The selection of an appropriate methodology is vital in order to achieve valid and reliable results. For this, it is important to understand the philosophical underpinning of this research. This section justifies the choice of methodology to this research. First, the positioning of this research within the overall philosophical continuum is explained followed by the research strategy chosen. The final sub-section discusses the research techniques, which is the main focus of this paper, used for data collection and analysis.

2.1 Research Philosophy

The basic beliefs about the world will be reflected in the way one designs the research, how one collects and analyses the data, and even the way in which one writes the thesis. Therefore, it is important to recognise and understand the personal paradigm as this will determine the entire course of the research study undertaken (Collis and Hussey, 2003). The term paradigm refers to the progress of scientific practice based on people's philosophies and assumptions about the world and the nature of knowledge (Collis and Hussey, 2003).

The two contrasting views on how social science research should be conducted can be labeled as positivism and social constructionism / phenomenology (Esterby-Smith et al., 2003; Collis and Hussey, 2003; Remenyi et al., 2003). The key idea of positivism is that the social world exists externally, and that its properties should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition (Esterby-Smith et al., 2003). The positivist philosophical stance assumes that the researcher is independent of, and neither affects nor is affected by, the subject of the research (Remenyi et al., 2003). Unlike the positivist, the phenomenologist does not consider the world to consist of an objective reality but instead focuses primarily on subjective consciousness. Thus, the phenomenological paradigm assumes that the reality is not objective or external but is socially constructed and given meaning by people (Esterby-Smith et al., 2003). This research intends to explore and investigate the ways leadership styles of female managers may contribute to the UK's construction industry development. Leadership characteristics and styles mean different things to different people (Pedler et al., 2004), thus a socially constructed idea should be obtained in order to identify the appropriate styles. In this context, it could be said that this research takes the overall phenomenological stance.

The research philosophy that is adopted contains important assumptions about the way in which we view the world. These assumptions will underpin the research strategy and the methods one chooses as part of that strategy (Sauders et al., 2007). The three major ways of thinking about research philosophy are ontology, epistemology and axiology (Collis and Hussey, 2003; Sauders et al., 2007). These ontological, epistemological and axiological assumptions are concerned with the nature of reality, the acceptable knowledge in the field of study and the values respectively. These three assumptions will help to position the research within the philosophical continuum. Accordingly,

Figure 1 shows the positioning of this research within the philosophical continuum in terms of ontological, epistemological and axiological assumptions.

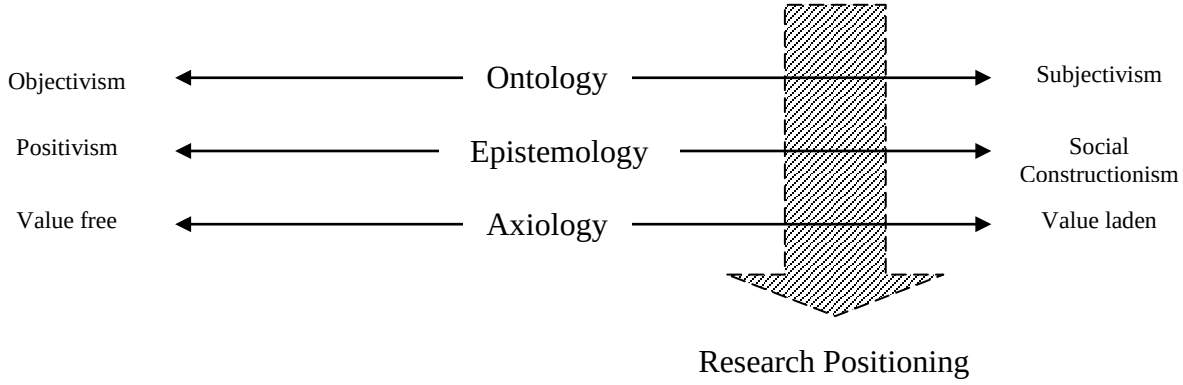

Figure 1: Positioning the research within the philosophical continuum

2.2 Research Strategy

A research strategy may be thought of as providing the overall direction of the research including the process by which the research is conducted (Remenyi et al., 2003). The type of research questions posed, the extent of control an investigator has over actual behavioural events and the degree of focus on contemporary as opposed to historical events are the three conditions that govern the choice of an appropriate strategy (Yin, 2003). In addition to the research questions and objectives, the choice of research strategy will be guided by the extent of existing knowledge, the amount of time and other resources available, and our own philosophical underpinning (Sauders et al., 2007). The commonly used research strategies in business and management research are experiment, survey, case study, action research and ethnography (Sauders et al., 2007; Remenyi et al., 2003; Esterby-Smith et al., 2003).

This research intends to find out the contribution of female managers towards UK's construction industry development by identifying the leadership styles exhibited by female managers in construction. Further, the perceptions by subordinates, superiors and peers towards the leadership styles of female managers are also taken into account to ensure that their contribution is beneficial towards the construction industry's development. An in-depth analysis of the construction industry with a gendered perspective is therefore vital for this study. In this study, the researcher neither is part of nor has control over the actual environment. Taking these qualities into account this research takes the case study as the most suitable strategy. The case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). This research adopts an exploratory, multiple, holistic case study. The case is 'female manager in construction industry' (individual) and the unit of analysis is the 'leadership styles exhibited by female managers in construction'.

2.3 Research Techniques

Research techniques refer to the specific methods used to collect and analyse the data. Data collection and analysis are developed together in an iterative process in a case

study (Hartley,2004). The following sub sections discuss the data collection and data analysis techniques used within the case study strategy.

2.3.1 Data Collection Techniques

This research adopts 3 data collection techniques within the case study and one other technique outside the case study. They are Multiple Leadership Questionnaire (MLQ), Personal Attribute Questionnaire (PAQ), semi-structured interview and expert interview.

Multiple Leadership Questionnaire (MLQ)

MLQ offers researchers the most validated and efficient measure of broad range of leadership behaviours (Bass and Avolio, 2006). MLQ, which measures, explains and demonstrates a broad range of leadership styles, has been widely used throughout the world in many, diverse cultures and organisations, and has shown to be reliable (Antonakis, 2003). In this regard MLQ will be used to identify the leadership styles exhibited by construction female managers.

MLQ identifies the characteristics of leaders and helps individuals discover how they measure up in their own eyes and in the eyes of those with whom they work. Thus it facilitates to capture a 360 degree view on the leadership styles exhibited by construction female managers. The MLQ has two questionnaire forms namely Self-rating form and Rater form. Self-rating form is for the leader which is the construction female manager in this study. Rater form is for her associates, who are at higher level, same level, and lower level and both males and females. Rater form can also be used with anyone who doesn't necessarily work with the female manager in the same organisation but in a position to provide sufficient information about her leadership styles. Those people are termed as 'other group' in MLQ.

The most recent version of the form is Form 5X which has two types such as short and long. The former contains 45 items for survey whereas the latter contains 63. MLQ (5X-short) has been chosen for this study as it is a recommended questionnaire for research purposes. The MLQ (5X-short) contains 36 leadership items plus 9 outcome items. The leadership items measures the leadership on nine leadership styles scales, 5 of which are related to transformational leadership, 2 of which are related to transactional and 2 of which are related to passive/avoidant leadership. The outcome items measures the outcome on 3 scales namely extra effort, effectiveness and satisfaction. Figure 2 illustrates the combination of items and scales under leadership styles and leadership outcomes.

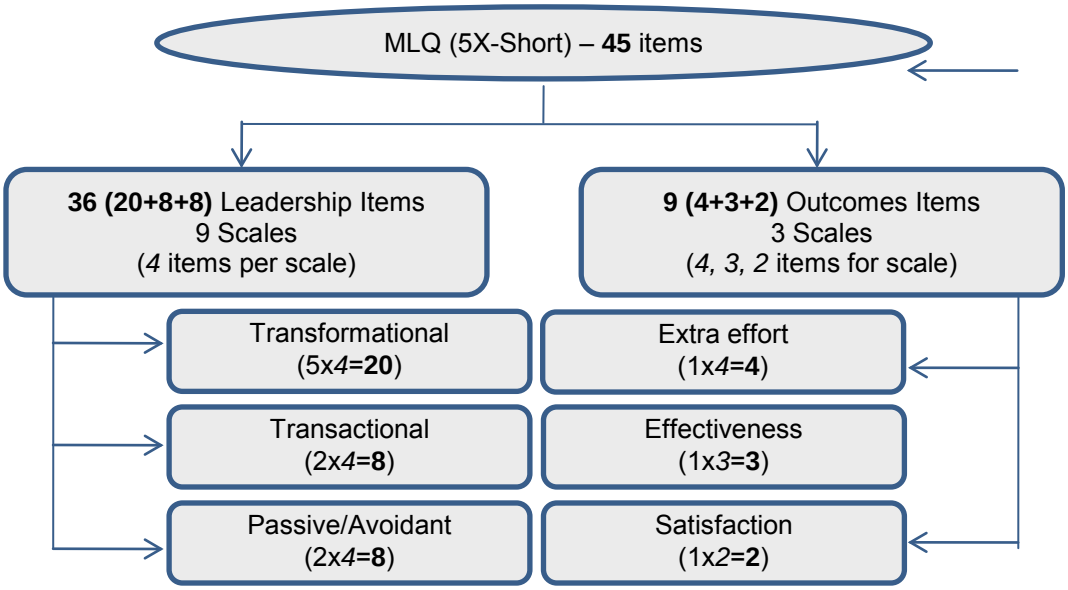

Figure 2: Combination of items and scales used in Multiple Leadership Questionnaire
Source: Mind Garden, Inc.

The MLQ in this research is used to measure the leadership styles of individuals (female managers in construction). It will reveal the leadership styles that are exhibited by the managers considering both self and others' perceptions. The results can also provide individualised feedback to the managers concerning desirable changes in their leadership styles. The outcome of the analysis will help to investigate the contribution of leadership styles female managers exhibit in the construction industry towards its development.

Personal Attribute Questionnaire (PAQ)

The leadership styles that are exhibited by a person are influenced by the person's gender (Cubillo and Brown, 2003; Larson and Freeman, 1997). When a socially constructed view is taken on defining a person's gender, then the leadership styles he or she exhibits also will have an impact from the societal views and expectations. Therefore, it is appropriate to find out the gender qualities of the construction female managers in order to see whether there is a relationship between their gender qualities and the leadership styles they exhibit.

To fulfil this purpose Personal Attributes Questionnaire (PAQ) by Spence et al. (1975) will be used. PAQ measures the degree to which a person can be classified according to masculine or feminine adjectives. It is a 24 item self-report questionnaire in which people are asked to indicate the extent to which they can be characterised in terms of various adjectives. The analysis of the PAQ will help to find out the personal characteristics of an individual in terms of masculine, feminine, or androgynous qualities. The results obtained from PAQ survey, together with the support of literature, will be used to determine the leadership styles that the leader actually possesses or is

able to exhibit. This will help to further analyse the reasons for any discrepancy between the styles that a leader could exhibit and a leader does exhibit.

Semi structured interviews

Leadership is generally contextual. It may vary depending on the situational attributes of different contexts or domains. An 'appropriate leadership' to one situation may not work in the same way when applying it in a different situation. In this context, construction, being a male dominated industry, may have an influence on the leadership styles exhibited by female managers. Therefore mere questionnaire survey may not be an ideal tool to capture the industrial specific barriers female managers face in exhibiting the leadership styles within the context of construction industry. The way to reduce this flaw is to talk to the female managers.

An interview, can be considered as a conversation held between two or more people. In research, interview is used as a data collection technique. This research uses semi-structured interviews as they have the advantage of being a 'halfway house' between the rigid layout of a structured interview and the flexibility and responsiveness of an unstructured interview (Moore, 2000). The interview guidelines prepared are aimed at capturing a wide range of issues related to the contribution of leadership styles exhibited by construction female managers. These issues cover personal information, job history, role of female manager in the organisation, context in which the manager works, skills and competencies, leadership styles, gender discrepancy issues, diversity issues, barriers in effective leadership, challenges they face in resolving problems. The guideline will be distributed to the respondents in advance, so that a constructive feedback will be able to obtain during the interview.

Expert interviews

Expert interviews, which are not part of case studies, will be conducted prior to the case studies. The purpose of the expert interviews is to obtain further knowledge in the subject from experts who excelled both in construction industry and in leadership. The outcomes obtained through expert interviews will be considered in analysing the semi-structured interviews carried out for case studies. Expert interviews will help the researcher to ensure that all important issues related to leadership's contribution towards industry development are captured when conducting case studies.

2.3.2 Data Analysis Techniques

Data analysis consists of examining, categorising, tabulating, testing or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study (Yin, 2003). It is important to have a data analysing strategy as it will guide the researcher to select the appropriate data analysing tools, ensuring that the evidence is treated well, and to generate sound and convincing analytical conclusions while discarding the alternative interpretations (Yin,2003).

The data collected through expert and semi-structured interviews will be analysed using content analysis. According to the process outlined by Miles and Huberman, (1994, pp 10-12) '*qualitative analysis involves three activities: data reduction, data display, and conclusion drawing*'. The first stage of analysis identified is data reduction, which is the process of selecting, focusing, and simplifying the interview transcripts by extracting

the most relevant data for all of the questions and from the responses to additional probes. This process will identify a number of issues addressed under the major subjects of the research. The second stage in the analysis process is data display. This is done by producing a data matrix. A data matrix will be produced by tabulating the interview data; the respondents listed as columns and the questions as rows. The final stage of analysis will be to display the data and draw conclusions. In addition, the quantitative analytical techniques adapted with the MLQ and PAQ will be used to analyse the data collected through MLQ and PAQ surveys respectively.

3 Integration of research techniques

All the research techniques used to collect data for this study are combined and the relationships between different techniques and between the techniques and the potential outcome are illustrated in Figure 3.

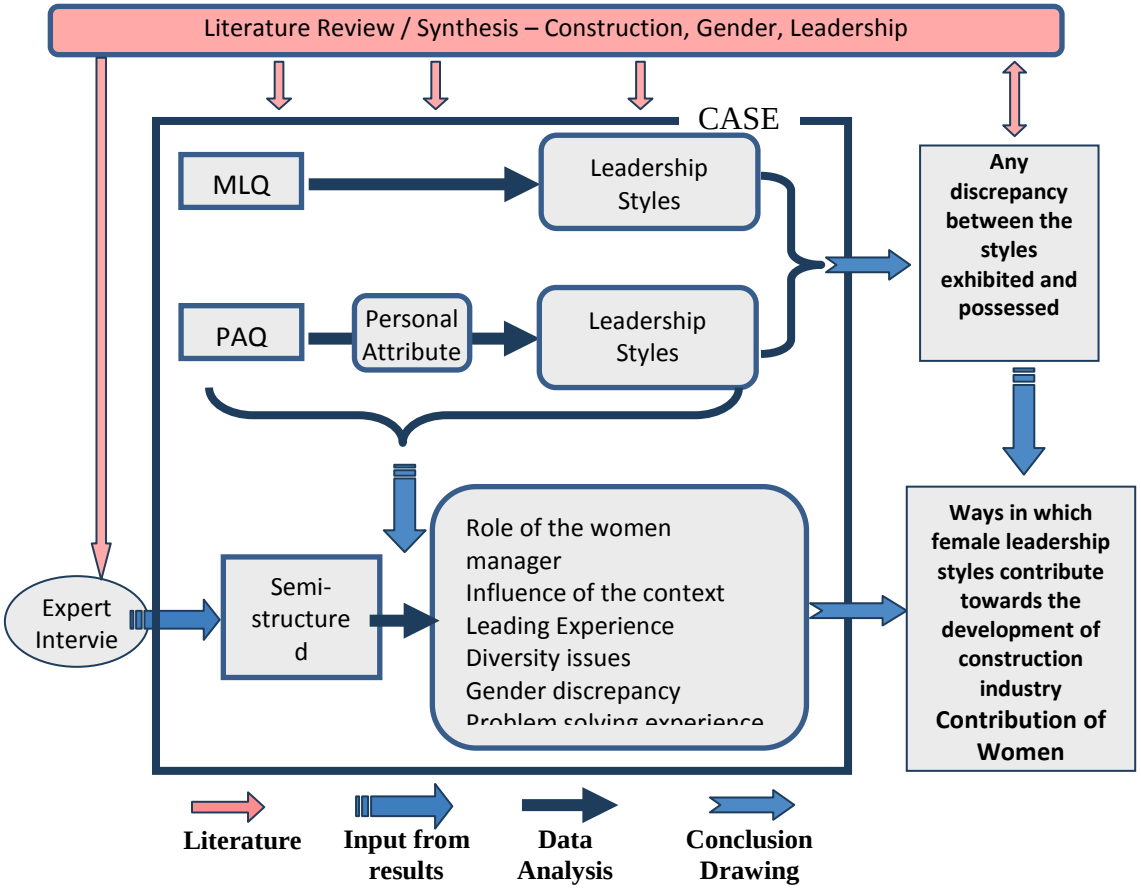

Figure 3: Research process and techniques

The outcomes from certain techniques are used as input for certain other as shown in Figure 3. The literature review and synthesis continuously support the research throughout its process. Its contribution is carefully considered when designing and analysing the research techniques. Figure 3 also shows the potential outcome that could be derived by analysing the different research techniques.

The issues identified during expert interviews in addressing the research problem will be considered when analysing semi-structured interviews carried out for the case studies. In addition, the survey results from MLQ and PAQ, which produce the leadership styles exhibited and possessed by female managers respectively, will also be an input for the semi-structured interview analyses. This will facilitate to analyse comprehensively the contribution of female managers towards the construction industry development. The potential outcomes of the semi structured interviews will address the role of female managers in construction industry, their leadership and problem solving experience, barriers they face in leading in a male-dominated industry, and diversity issues. These outcomes from the case study together with the knowledge and understanding obtained through literature survey will be analysed to draw the final conclusions.

4 Conclusions

The skills and labour shortages in construction industry both at technical and managerial levels, increased demand of construction works, difficulties in recruiting traditional workforce and lack of migrant workers in managerial levels drive the construction industry to consider the diverse skills and talents that could come from the female workforce. There is a dearth of research specifically focusing on contribution of leadership styles exhibited by female managers in the construction industry. Therefore this research intends to investigate the leadership styles exhibited by construction female managers in order to analyse the contribution of such styles towards the construction industry development. Multiple Leadership Questionnaire (MLQ), Personal Attribute Questionnaire (PAQ), Semi-structured interviews and Expert interviews are the research techniques used for data collection. Content analysis and the quantitative analytical techniques associated with MLQ and PAQ are the techniques used for data analysis. This paper will be a supportive resource to any reader interested in defining a methodology to a specified research study.

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Critical Success Factors to the Implementation of E-learning in Libya Higher Education (HE).

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Abstract:
In terms of performance, communication, outreach, access, sources, training etc., electronic learning (e-Learning) has improved the performance of industries, including Education, worldwide. . However, the implementation of E-Learning in developing countries, for political, economic, social and cultural reasons, lag behind the developed world. This research paper discusses in general the role and effectiveness of e-Learning in the Libyan Education System. It focuses on the factors that affect e-Learning in the educational system in Libya. The aim of this study sheds light on the role of e-Learning in the Libyan Education System and how it can be improved. The objectives are to investigate the factors and issues which are necessary in setting up a sufficient and effective e-Learning system that may help improve the performance of the Educational System.The research is split in two major parts. The first is a literature review; this will investigate all the factors and issues that are related to e-Learning in HE such as technologies, infrastructure, equipments, etc. The second part will be select a case study (Regional Educational e-Learning System in Libya) and pinpoint how to enhance its performance by improving e-Learning in terms of negotiating all factors and issues that positively affect its outcome. Finally, finding will be stated upon the analysing process based on both literature review and case study.

Keywords:
E-learning, Developing countries, e-Learning Factors, Libya, Research Methodology

1 Introduction

1.1 Introduction

E-learning means the easy use of information and communication technology and inclusion of the internet in teaching and learning. Yieke (2005) define E-learning as learning facilitated and supported through the use of information and communications technology. Khan (2000) defines that E-learning encompasses web-based learning (WBL); internet-based training (IBT); advanced distributing learning (ADL); and online learning (OL).With the aid of E-learning further and higher education can be delivered

anywhere and at any time. Colleges and universities are using E-learning to make learning more accessible and efficient. It enables students of all ages and abilities the chance to learn anywhere, at any time and at their own pace. E-learning enhances the learning process by offering a different way of delivering education. Despite the importance of E-Learning in higher education (HE) and human development in Libya, implementation of E-learning is facing a number of challenges in Libyan universities. Those challenges can be summarized as follows: Leadership; ICT infrastructure; Finance; Culture; Instructors & learners; and Technical expertise. Regardless of these challenges the future is optimistic, offering innovative and advanced opportunities to implement e-learning.

The E-learning program, if established in Libya, will help to solve the problems resulting from a shortage of traditional education institutions that hold an increasing number of students who wish to study at university providing them with a chance to learn and promote scientific cooperation and research in order to reach every individual in the community. E-learning would also provide education for those who missed such opportunities and give provide them with knowledge of technological developments to continue in other areas of technical development. .

This paper includes sections on the research aims, objectives, research questions, research methodology, and expected contributions to the body of knowledge, and will benefit the policymakers who are planning and designing the Libyan HE system, as well as the stakeholders; i.e. the teachers and students. It will also help to determine the specification of main factors in the E-learning process in Libya, and find out the difficulties faced when implement e-learning and its methods

1.2. The problem

Libya is a very large Arabic state and the distribution of the population is concentrated over specific wide-spread areas, this can involve long distance in order to attend educational centres, especially for people who may be physically handicapped, however, there is an increasing demand for higher education and the growing number of students. It is difficult to reach the students living in rural areas as universities are located in the few large cities. In order to provide Higher Education to high school graduates and the need to enhance the ICT sector in Libya to reach all rural people is crucial (Porter, 2006). Abouchedid (2004) reported that the statistics on access to computer and ICT applications in the Arab world show a serious digital divide between Arab countries and the developed world. Access to E-learning technologies in education is no exception in this context; it becomes necessary to convoy with the development and using the E-Learning (Twati, 2006).

According to Abdelraheem (2006), establishing new educational institutions in Arab countries is hard and costly especially in rural areas which are in more need for such facilities. Those institutions need investment for the buildings, for the equipments, for the labs ...etc. Rural areas in particular have limited expert human resources with necessary skills. We can see that E-learning is vital to the Arab countries; it is a solution to many of its human development problems (Abouchedid, 2004). Unfortunately, this solution is not very smooth as it seems to be. E-learning is facing a lot of obstacles, barriers, and challenges in Arab countries.

2 Aim and objectives:

This paper is part of a PhD research that aims to develop a framework that identifies the factors affecting implementation of E-learning in HE in Libya however, this paper will only focus on methodology chosen for the research. To achieve this aim the following objectives are lad out: To explore the major barriers that affect implementation of E-learning; To carry out an in-depth investigation to understand the factors affecting adoption of e-learning in HE in Libya; To develop the framework for adoption of E-learning in HE in Libya; To make specific recommendations to overcome the barriers affecting adoption E-learning in Libya; To validate the framework.

3 Research questions:

The research questions are:

Why is there no implementation of E-learning in HE in Libya till today?
What are the factors / constraints affecting implementation of E-learning in Libyan HE?
How do these constraints affect the implementation process of E-learning in Libyan HE?
How can these constraints be overcome for a successful implementation of E-learning in HE in Libya?

4 Critical Success Factors (CSFs) & literature review

According to (Collis and Hussey, 2003) a theoretical framework is a collection of theories and models from the literature and it is a fundamental part of a positivistic research as it explains the research questions or hypotheses. But for a phenomenological study, it may be less important or less clear in its structure. Some researchers have attempted to approach their research where no prior theories exist. In this paper the factors found through the literature review would affect implementation of E-learning. These factors are listed in Table 1 bellow the following discussion:

4.1 Leadership Support

The transition from traditional delivery methods to the implement of E-learning environments inevitably involves the management of change (Betts, 1998). The need for support from organization's leaders is necessary to begin and maintain any new approach to learning are addressed in the works of Abdelraheem (2006); McPherson and Nunes (2006). Moreover, Liaw et al. (2007) went further by stating “instructors' leadership is a crucial factor to affect learners' attitudes to implement e-learning”. If a leadership fails to understand currently emerging futuristic technologies and their potentials to develop a vision and strategy to support and enhance learning, acceptance of E-learning would be slow if not impossible (Minton, 2000).

4.2 Infrastructure

Lack of public awareness about ICT and weak data communications infrastructure is one of the main factors affect E-learning (Karmakar and Wahid, 2007). An organization that wants to implement E-learning should accomplish at least the minimum hardware

requirements and the software required. The hardware part of E-learning includes the physical equipment that must be able to supply E-learning (e.g., servers and networks) (O'Neill et al., 2003; Ettinger et al., 2006). O'Neill et al., 2003 cited from Volery and Lord suggested that the success of technological infrastructure also has implications for the success of virtual learning; a malfunctioning hardware or software can all be barriers which can cause frustration and affect the learning process. Valentine (2002) agrees with O'Neill et al. and identifies hardware and tool malfunctions can be great detriment to the effectiveness of E-learning.

Without easy access to appropriate equipment, it is quite hard if not impossible to implement any E-learning. However, Broadbent (2001) states that E-learning does not require a huge infrastructure, even a well working internet connection and the provision of enough numbers of computers for end-users would be sufficient for an effective E-learning project. James-Gordon et al. (2003) diagnosed that the limitations related to the network capacity of the internet can be a factor to implement E-learning and the reason why video and audio transmission can be relatively slow over the internet is that the bandwidth cannot cope with the large file sizes. Minton (2000) sees that implementing E-learning requires a minimum technological platform, which includes necessary hardware, adequate telecommunication capabilities and access to software. Universities have to decide what systems, resources and infrastructures would be required to support this type of learning adequately.

4.3 Cost

The consideration of the initial costs as well as the continuing costs of installing, maintaining, using and upgrading technology and the human capital costs to support E-learning is very important Valentine (2002). Marengo and Marengo (2005) demonstrated that the costs of technological infrastructure is digital content costs, maintenance costs, content hosting costs, hardware and software costs and costs of E-learning staff. Staff costs include tutoring costs, administration and management costs and Expert in Multimedia Technology (ETM) costs. In addition Marengo and Marengo (2005) mentioned that in cases where the hardware and software supplied by the faculty to circulate the contents are not sufficient, the E-learning evaluation need to take into account the cost of items, such as purchase of a server and its relative software. The lack of money can be problematical for implementation of E-learning with continuous labour costs of instructors (Cho and Berge, 2002; James-Gordon et al., 2003; Berge and Muilenburg, 2006).

4.4 Resistance to changes

The resistance to change is one of the important factors for implementation of E-learning (Minton, 2000; Cho and Berge, 2002; Berge and Muilenburg, 2006; Ettinger et al., 2006). The resistance to change is usual because of high percentage of illiteracy in some countries (Karmakar and Wahid, 2007). Moreover, Habibu (2003) stated that the resistance to change is one of the factors which should be considered when implementing E-learning. It is related particularly to non-technical issues that include academic staff, administrators, and/or managers. It is divided into three main reasons: fair of ICT; lack of time to design, develop, maintain; support online classes materials, and fair to expose the quality of their work. The lecturers are one of the major factors contributing to the success of E-learning. For lecturers, implementation of E-learning

programs represents a change in teaching style and materials. The precise nature of the change is difficult to quantify (O'Neill et al., 2003). O'Neill et al., (2003) stressed that human resources should be committed to the project at an early stage and lecturers should be selected based on their attitude towards technology. According to Liaw et al. (2007) the personal attitude is a major factor to affect usage of IT. Understanding user's attitudes toward E-learning facilitates is important for the creation of appropriate e-learning environments for teaching and learning.

4.5 Staff Education/Training

Besides the lecturer's attitude about using technology, the lack of trained staff delivering instructions is also important (Valentine, 2002). Liaw et al., (2007) addressed that the lecturers should have knowledge and experience using operating systems, the internet, e-mail, word processing packages, Power-point and basic computer skills to implement E-learning. In this context experienced and qualified staff are an important factor for implementation of E-learning. According to Levy and Maria (2003) the instructors require training and support to be willing to implement this new teaching paradigm.

4.6 Technical Expertise

Lack of personal technological expertise to solve technical problems is one of the main factors for an E-learning program (O'Neill et al., 2003; Berge and Muilenburg, 2006). Valentine (2002) added the one overlooked factor in the success or failure of E-learning programs; i.e. role that technicians play in e-learning. According to McPherson and Nunes (2006), the need for technical support in using the ICT infrastructure as well as good maintenance of this infrastructure is the main factor for implement E-learning. It may require a project manager, software programmers, multimedia experts, instructional developers, and others, including information systems experts. Even more Marengo and Marengo (2005) specified that expert in multimedia technology has to support teachers in the activities of organization and management, and to some extent the development of E-learning courses as well. Moreover Cho and Berge (2002) reported that an organization couldn't successfully implement E-learning or blend learning without proper attributes of its infrastructure and make technical expertise and technical support easily available.

Table 1: The critical success factor from literature which affecting implement of e-learning is described below

No	The factor	The researcher's names, the year of its publishing
1	Leadership	[Liaw et al. 2007] , [Abdelraheem, 2006]. [McPherson and Nunes, 2006] [Minton, 2000] [Betts, 1998].
2	Infrastructure: -Hardware -Software -Internet -Network -Support Tools -Server	[Karmakar and Wahid, 2007] [McPherson, 2006] [Ettinger et al., 2006]. [O'Neill et al., 2003] [James-Gordon et al. 2003] [Valentine, 2002] [Broadbent, 2001] [Minton, 2000]
3	Cost:	[Berge and Muilenburg, 2006]

	-E-learning staff -Content Hosting Cost -Digital content	[Marengo and Marengo, 2005] [James-Gordon et al., 2003] [Valentine, 2002]. [Cho and Berge, 2002]
4	Resistance to changes: -Academic Staff -Administration	[Liaw et al., 2007] [Karmakar and Wahid, 2007]. [Berge and Muilenburg, 2006] [Ettinger et al., 2006] [Habibu, 2003] [O'Neill et al., 2003] [Cho and Berge, 2002] [Minton, 2000]
5	Staff Education/Training	[Liaw et al., 2007] [Levy and Maria, 2003] [Valentine, 2002]
6	Technical Expertise: -EMT -Software Programmer -Information System -Project management	[McPherson and Nunes, 2006] [Berge and Muilenburg, 2006] [Marengo and Marengo, 2005] [O'Neill et al., 2003] [Cho and Berge, 2002] [Valentine, 2002]

5 Contribution of the research

This research will be considered as one of the first E-learning initiative for Libya.

There is no published academic study such as dissertations or theses, as well as no previous empirical research conducted to investigate the issue and it therefore represents originality in this field.

This research will assist the Libyan Higher Education in building and implementing E-learning strategy.

The study will be a useful resource for both researchers and practitioners who have a strong interest in understanding e-learning adoption for design and implementation.

6 Research methodology

The two main research methodological approaches are deductive and inductive. Saunders et al. (2007) encourage combining deductive and inductive approaches within the same piece of research. The two combined research approaches (inductive and deductive) will be selected for this research to achieve the objectives of the study. In this research a theoretical framework is first derived from the existing literature which will be investigated in the case study organization (deductive approach). Subsequently the author expects to incorporate the findings from case studies into existing theory (inductive approach).

6.1. Research Design

The aim of the research design or strategy is to satisfy the research aim and objectives. The case study research methodology has been highly recommended by several researchers as an ideal instrument for an in-depth understanding of contextual

phenomena (Yin, 1994). Therefore, in this study the exploratory case study will be selected as an appropriate research strategy. As Yin (1994) stated that a case study approach is a suitable method when it focuses on a contemporary phenomenon. This is precisely what this research is about, i.e. to identify the factors affecting implementation of E-learning in HE sector in Libya.

6.2 Data collection methods

This research depends on two main kinds of data:

Secondary Data: Historical data collected for other purposes but are related to the subject of the study which the researcher has gathered to build the theoretical base for this study. The sources of these data are mainly reference books, papers, articles, researches, thesis, magazines and Internet.

Primary Data: Data that is collected specifically for the purpose of this study. Semi-structured interviews will be used as the main source for data collection purposes. This type of interview is thought to be the best method for data collection as it involves an interaction between the interviewer and the interviewee for which the purpose is to obtain valid Information. Observation and the collection of supporting documentation will also be utilized for triangulation purposes. The interviewees are the Dean of Faculty, Heads of Departments, top managers or administration, academic staff. The use of several data collection methods i.e. interviews, documents, and observation within one case study is intended to achieve the triangulation of data, in order to increase the validity of the findings and the researcher confidence in the reliability of the information obtained. For the purpose of data collection, the question schedule will be developed in English. However, because it will be used to collect information in Libya, the English version will be translated into Arabic. For the purposes of analysis, the interviews in Arabic will be translated into English.

6.3 Selection of case study

Rather than a random sampling strategy, a single case study approach will be adopted and a theoretical sampling strategy will be explored and selected for appropriate selection of the case. . In the Libyan Higher Education sector, the Ministry of higher education is sought as an effective case study which can be satisfied as the unique and important case and has enough criteria for the study. Therefore, in the Ministry, performing the case study can be effective as a critical and unique case. The following are reasons for selection of the case study:

The Ministry of higher education controls all the universities in Libya. It has all higher education programs and is the only Libyan organization that is specialized and representative in Higher education.

The Ministry of higher education has well educated and professional people who have had enough knowledge of technology.

Accessibility to the selected case study will be straightforward for the author as the ministry of higher education is situated in Tripoli, Libya’s capital city. This allowed the researcher to contact the sector easily considerably reducing travel time and cost.

6.4 Sampling of case study

The case study was conducted in Libya during the period from august to September 2008. All the interviews were carried out in the interviewee's offices to have the opportunity to access to the relevant documents. The numbers of interviewees in case study organisation were 20; the respondents represent top management, deans, academic staff and support staff. Covering the four three managerial levels enhanced the validity through triangulation of the data gathered from different point of views from the respondents. Face-to-face open ended questions allow the interviewer to gain in-depth information. The time allocated for each interview is fluctuated; in general, the average time was about forty five minutes to one hour and half.

7 Finding and Discussion

The findings show that the leadership and professional opinions confirm the advantages of e-Learning, however, the changes require strong and supportive leadership as well as changes in the organizational structure and culture. On the other hand, in order to drive the strategy forward within their institutions the educational leaders should be convinced of the benefits of e-learning.

The need for support from HE leaders to obtain the funding for technology, staffing, and other resources is necessary to start and maintain any new approach to learning. An institution that wants to implement E-learning should fulfil at least the minimum hardware and software requirements in order to operate this hardware. The hardware part of e-Learning includes the physical equipment that must be able to supply e-Learning.

Without easy access to appropriate equipment, it is difficult to implement any e-Learning programme.

The HE educational institutions have faced several barriers posed by the rapid evolution of ICT, which form the backbone for E-learning. Universities should consider the costs of installing, maintaining, operating and upgrading technology to support e-Learning. In addition, the human capital costs should also be factored to calculate the true cost for E-learning.

According to interviews conducted by the researcher, the resistance to change is one of the factors which should be considered when implementing E-learning, and it is usually because of a high percentage of illiteracy from senior staff. In some faculties resistance to change factors were confirmed and it was found for the following main reasons which are fear of ICT; lack of time to design, develop, maintain; support online class materials, and fair to expose the quality of staff's work.

Lecturers need training and support to be willing to adopt this new teaching paradigm. The instructors should be trained to take advantage of both their experience and able to adapt that experience to the new environment of E-learning. Therefore all staff involved in E-learning require a wider scope of knowledge and technological skills, such as the ability to use multimedia, email and Internet. Lecturers should be trained use these and be able to adapt these to the new environment of e-Learning.

Finally, the need of expertise in solving technical problems is one of the main factors when introducing an e-Learning program, and HE in Libya need to provide technical support in using the ICT infrastructure, as well as infrastructure maintenance. The universities cannot successfully implement e-Learning or blend learning without the availability of technical expertise and adequate infrastructure support.

8 Future work

Supplementary work should be conducted in different educational institutions for generalisation of data, especial in rural university. Students' and new staff's attitude should be counted towards implementing e-Learning.

9 Conclusion

The failure of the Libyan HE to accept and develop a vision and strategy to understand the current emerging advanced technologies, will seriously undermine any potential to implement the e-Learning Process. e-Learning requires a minimum technological platform, which includes necessary hardware, adequate telecommunication capabilities and access to software. The costs of technological infrastructure is to contain digital-content costs, maintenance costs, content hosting costs, hardware and software costs and costs of e-Learning staff. Staff costs include tutoring costs, administration and management costs and Expert in Multimedia Technology (ETM) costs. Lecturers should be selected based on their experience, potential and outlook toward new technology. The expert in multimedia technology has to support teachers in the activities of organization and management, and to some extent the development of e-Learning courses as well. The implementation of E-learning programs represents a change in teaching style and materials.

This paper has contributed to the discussion of the main success factors and methodology used to implement e-Learning.

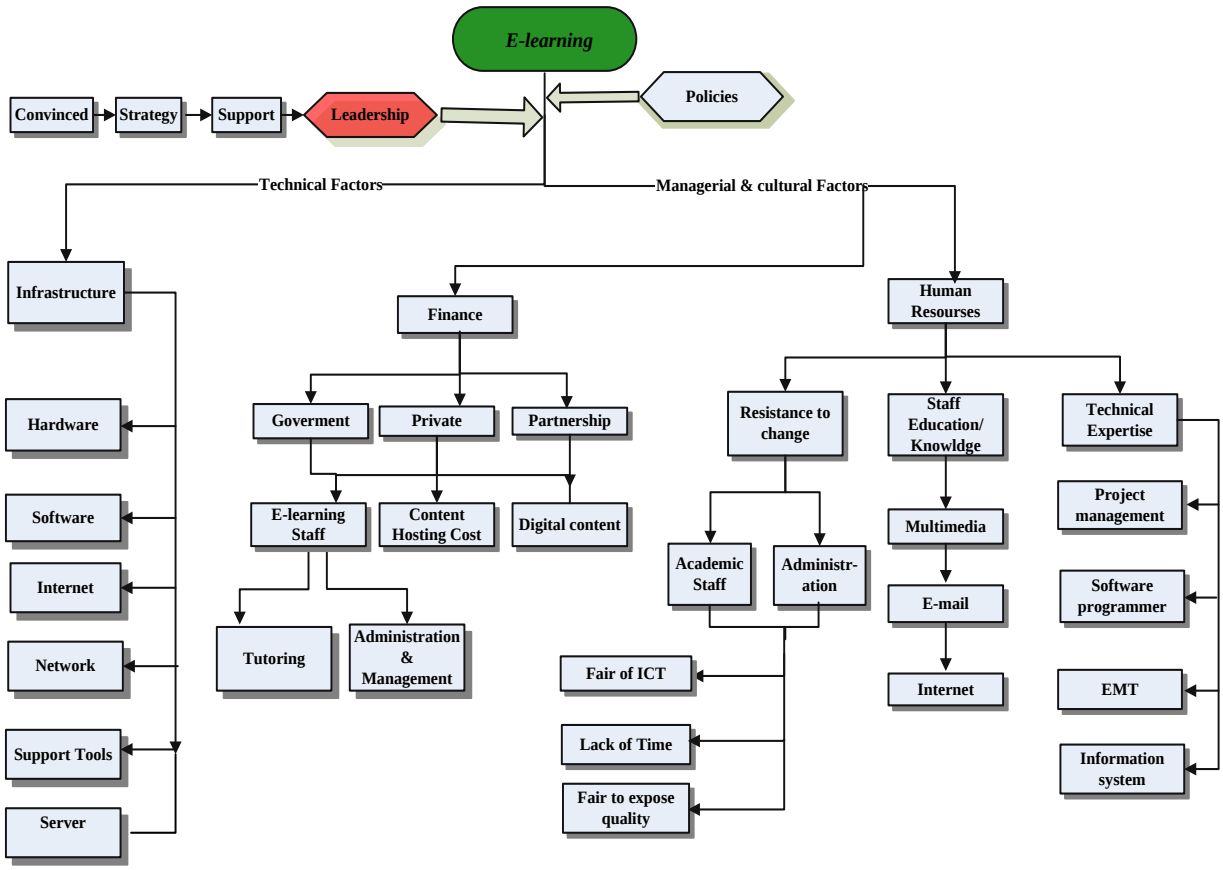

Figure 1. A framework for Critical Success Factors (CSFs) that affecting implementation of e-Learning in Higher Education (HE) in Developing Countries.

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The Role of Technology Transfer in Improving Manpower Capability in Private House Building Companies in Libya

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Abstract:

During the last few decades, major transfers from the public to the private ownership have taken place around the world, as there is strong evidence supporting the positive effects of privatisation. This trend has made privatisation one of the most important economic policies worldwide in recent years. The shift in policies has stimulated governments all over the world to embark on privatisation for different reasons, the most common being the hope that new private owners would increase efficiency and productivity of business activity. This change in the structure of economies in many developing countries has created potential opportunities for the integration of local and foreign companies and the adoption of new technology. In this respect, technology transfer is seen as one of the most important features that improve the capability of privatised firms. However, in many developing countries like Libya, the technology has not been exploited properly. For instance, housing companies in Libya have not developed in terms of manpower capability and capacity to execute major projects, as evidenced through a lack of professional house-building techniques. The objective of the paper is to present a literature review of the work undertaken in this area and to provide a synthesis of the ideas published.

Keywords: Privatisation, technology transfer, Manpower capability, Libya

1 Introduction

Privatisation is one of the most important elements of the continuing global phenomenon of the increasing use of markets to allocate resources (Megginson and Netter, 2001). The decades of the 1980s and 1990s have witnessed a major worldwide shift from the public to the private sector, since strong evidence exists to support the positive effect of privatisation. For example, Leeds (1989), D'Souza and Megginson (1999), and Okten and Arin (2006) have stated that privatisation relieves the financial and administrative burden of the government, promotes competition, improves efficiency, and increases the productivity of services. Privatisation in many developing countries has also created potential opportunities for participating local firms

to enter into collaborative ventures with foreign firms. These opportunities provide local companies with the chance to learn new technologies from foreign companies, and also allow firms to select the ways in which these technologies are obtained, through for example, such arrangements as foreign direct investment and joint ventures. In many developing countries, however, Libya being one, the potential of new technologies has not yet been properly exploited. Overall, privatisation is considered to facilitate access to the building technology and modern management techniques required to improve manpower skills. Hence, this paper reviews the role of technology transfer in improving manpower capability in private house building companies.

2 Research Aim and Methodology

This paper is an initial part of a PhD thesis which aims to understand the role of technology transfer in the improvement of manpower capability within the concept of the privatisation. In order to achieve this aim, the methodology approach will be a critical literature review related to this area.

3 Literature Review

The objective of this section is to review literature on improving manpower capability within house building companies. The section enables us to understand the role of technology transfer in improvement of manpower capability within a concept of privatisation.

3.1 Privatisation

A review of the literature on privatisation provides a wide variety of definitions, showing there is no single consensus of opinion, and that the concept of privatisation is considered differently by different businesses, and different people in different countries. Awamleh (2002) stated that privatisation is not a mere economic concept, but rather is a more comprehensive and complicated socio-economic and political philosophy. A more direct concept of privatisation refers to the transfer of ownership and control from the public to the private sector with particular reference to asset sales (Walle, 1989). In the broadest sense, it refers to a whole range of reformative actions designed to subject administrative activity to the disciplines of the market place, in other cases, it maybe specialised as an act of selling state-owned enterprises, assets or shareholdings (Liou, 2001). In attempting to integrate these definitions of privatisation, it can be said that privatisation is transfer of ownership from public to the private sector, whether through a transfer of part or whole business activity.

3.1.1 Why Privatise?

The key objective of privatisation is to increase competition and thus improve economic efficiency and productivity. That is, to increase output and to decrease prices. D'Souza and Megginson (1999) stated that transfer of government ownership to private ownership is a significant determinant of SOE performance improvement. Eyyuboglu, (2006) commented that the efficiency of private firms is better than that of public ones. Furthermore, Kay and Thompson (1986) produced various reasons for privatising SOEs as follows:

1. SOEs are inefficient and privatisation improves economic efficiency.
2. Privatisation gives managers rights over assets and cash flow, which results in the reduction of politicians' influence, and more efficient management and decisions.
3. The divestiture of SOEs can help the development of domestic capital markets.
4. The privatisation of SOEs reduces government debt.

It can thus be appreciated that inefficiency in the public sector is the basic reason for the adoption of privatisation**.**

3.1.2 Experiences of Privatisation

In the modern era, clear-cut privatisation schemes emerged in the United Kingdom under the leadership of Margaret Thatcher in the early 1980s. Although her government may not have been first to launch a privatisation programme, described by Peter Drucker in his book *The Age of Discontinuity* (Bel, 2006), it did undertake enormous privatisation projects in British Telecommunications and British Gas. Subsequently, privatisation spread throughout the world (Bishop and Kay, 1989), as such programmes rapidly gained popularity. Indeed, since 1989, more than 70,000 enterprises have been privatised in Central and Eastern Europe, and privatisation is currently a major target on the policy agenda in China, India, and many other developing countries (Megginson and Netter, 2001). The study by D'Souza and Megginson (1999) was based on 85 enterprises in 28 countries from 1990 to 1996. They covered 16 enterprises in industrialised countries and 12 transitional countries, reporting significant improvement in the business activity, and a small (but not significant) decline in employment. Privatization is often accompanied by reducing employment, but this is not always so. Megginson et al (1994) examined 61 enterprises from 18 countries and 32 different industries to compare the pre- and post-privatisation performance. The sample included six developing countries and 12 industrialised countries. The evidence suggested that business activity increased significantly after privatisation, and in their study they found no evidence that employment levels fell. However, the Yarrow, (1989) study stated the service at British telecom was reduced after privatization. In the case of Arab countries, Morocco was the first to formally endorse privatisation as a policy, quickly followed by Tunisia, Jordan, and Egypt (Otman and Karlberg 2007). Libyan SOEs, as in other countries, are faced with a number of problems. As Colonel Qadhafi himself stated publicly at the General People's Congress in Sirte in January 2000, the public sector in Libya has failed to deliver its economic goals. Following this, in June 2003, the government introduced a comprehensive plan for privatisation with the aim of liberalising the economy, and 360 SOEs were privatised (Otman and Karlberg, 2007). According to the International Monetary Fund (2005), the Privatisation programme was initiated in January 2004, with the sale of 360 economic units. In 2006, the Libyan government amended various policies and regulations related to the privatisation, to make it easier for local and foreign firms to integrate with a view to the local companies accessing new technology.

3.1.3 Privatisation and Opportunities for Technology Transfer in Libya

Privatisation results in the significant inflow of foreign investors, and enables firms to more easily interact with foreign firms. This interaction generates an increase in the resources needed for economic growth. Technology plays an important part in the application of these resources, and is becoming the great interest of both developed and developing countries. The selection of a suitable technology is not, however, the whole story since the problem remains of how to select a suitable mechanism of technology transfer, and this requires decisions regarding the choices. In fact, there are numerous mechanisms through which technology may be transferred domestically and across international boundaries. For instance, joint venture (JV), foreign direct investment (FDI), trade in goods, licensing, and movement of people (Ofori, 1994; Kumar, 1999). Joint venture will be targeted as an important vehicle of technology transfer, and the means to improve manpower capability in Libya. The government argues that the new regulation is an encouragement to private enterprise to join with foreign companies, the motive for Libyan companies being to collaborate with a view to learning and understanding new technology (Karin, 2007). Joint ventures between foreign and local companies are a recognised mechanism for technology transfer and, therefore, one way of improving the skills that are lacking (Ofori, 1991; Carrillo, 1996). The most important feature of joint ventures is that the partners can share tangible assets, such as profit, and intangible assets, such as skills and knowledge. For effective collaboration between people in local and foreign companies, minimum requirements to facilitate communication must be met. This could be the point of any discussion in manpower capability.

4 Concept of Technology

Schon (1967) defined technology as any "tool or technique, any product or process, any physical equipment or method of doing or making, by which human capability is extended". Technology may be defined as the application of an existing body of knowledge to the production of goods and services (Ofori, 1994). Technology would also include both hardware, such as machinery and equipment, and software such as skills and knowledge (Alzavian, 2007). A further extension of technology components is given by Ramanathan (1994), and Sharif (1994), who identify four components of technology which are Technoware, Humanware, Infoware and Orgaware. It can be said that all components of technology are required in order to facilitate effective technology transfer. The Humanware is the centre of all these components, and embraces all the required skills, knowledge and experience to use equipment and machines (Technoware). The Infoware is required to facilitate the process of technology, and the Orgaware is required to allow all components to come together in the same environment.

4.1 Concept of Technology Transfer

Technology transfer has been defined in many different ways. At a macro level, it is referred to as a concerted effort by developed countries to pass on technology, know-how and expertise to locals in developing countries who do not have these skills. This country-level definition can be contrasted with a firm-level definition as proposed by Gibson and Smilor (1991), and Sexton and Barrett (2004), that technology transfer is viewed as the movement of knowledge and technology via some channel from one individual or firm to another. These definitions show that the objective is one which is transferring technology in forms of hardware and/or software.

4.2 Elements of Technology Transfer

Human resources, information, equipment resources, and capital are four elements of technology transfer (Nation, 1989 as cited by Hong, 1994). All elements of technology transfer are important and influence each other, but human resources lie at the centre of any effective technology transfer for both software and hardware.

4.3 The Importance of Manpower Capability as Part of Technology

There is no doubt that manpower capability is central to the success of technology transfer. . Makhija and Ganesh (1997) stated that a capability is the capacity for utilising a set of resources, including skills and knowledge to perform some task of activity. Hong (1994) found that human resources play a significant role in technology transfer. However, humans require specific programmes to improve their capability. Bosworth and Dutton (1990) noted that training is a key mechanism for improving manpower skills. On the same theme, Richardson (2006) asserted that a weaknesses in the training system, is the main important reason for unskilled manpower. From above discussion it can be said that training plays an important role in the improvement of manpower capability, especially when integration between local and foreign companies occurs because the integration will open up opportunities for local companies to learn new technology and gain access to new training.

4.4 Manpower Capability in the Libyan Context

The lack of manpower in general and skilled manpower in particular, as well as the low degree of industrialisation in the construction industry, are the main reasons for the inadequate building capabilities that have caused long delays in the implementation of housing programmes (Essayed, 1982; Salama and Flanagan, 2005). Libyan house builders have low capability to meet the demand of housing, and the Libyan government is demanding its projects be completed faster to fill housing shortage. Thus, house building companies are looking for ways to deliver projects more efficiently and solve the problem of low manpower capability. Offsite manufacturing technology appears to be one approach to overcome the challenges. Off-site manufacturing has several advantages including less project duration, higher quality, lower cost, more productivity, fewer people on site, and simpler work processes (Gibb and Isack, 2003). However, offsite building technologies have not been utilised widely in Libya. Since privatisation has facilitated joint ventures between LPHB companies and foreign companies, LPHB companies have a significant opportunity to improve not only offsite technology, but also other technologies. For example, computer technology gives a company a potential tool for the efficient handling of the enormous amount of information that is helpful in decision-making and helps in improving the design system. In addition, the Internet has improved communication systems. However, collaboration between people in local and foreign companies requires a common medium of communication, and in this respect Salama and Flanagan (2005) have argued that a poor command of English among Libyan labour affects and reduces the benefits from foreign companies

5 Conclusion

Changes in the structure of economies in many developing countries, coupled with the rapid pace of population growth, have increased housing demand. However, public sector has been

unable to meet housing demand in many countries both in terms of quantity and quality. Privatisation is considered to facilitate access to the technology and modern management techniques required to improve manpower skills, through involvement of foreign companies with local companies. This paper can be considered as an attempt to identify the role of technology transfer in improving manpower capability within a concept of privatisation.

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Empowerment of Women in Post Disaster Reconstruction: Research Methodological Perspectives

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Abstract:
The credibility of research findings is an important aspect of any research success. This is influenced by the selection of an appropriate research methodology. Research methodology is the overall approach to be used in research process from the theoretical underpinning to the collection and analysis of the data. In this context, this paper identifies the research methodology adopted for the study on empowering women in post disaster reconstruction. It also examines the suitability of the research methodology to the study. In order to achieve the aim, the paper brings forward the theoretical underpinning related to philosophies, strategies and data collection and analysis methods within the study context. Although earlier studies have different perspectives on using surveys for social research, the recent developments within the literature on surveys have given a break through for social studies. The study considers the reality through a position of Pragmatist and adopts the survey as a research strategy.

Keywords:
Empowerment, Post disaster reconstruction, Research methodology, Survey, Women

1 Introduction

The recent increase in the number of disaster occurrences (Altay and Green, 2006) has urged the policy makers and researchers to focus on the enhancement of society's capacity. In order to reduce damage to both human and material resources and to withstand disasters there is a strong need to develop disaster resilient communities. Within this context, this research investigates into empowerment of women during post disaster reconstruction in Sri Lanka. Since research is an activity that needs to be approached with both discipline and rigour (O'Leary, 2004) adoption of a suitable methodology is an important step for its credibility. Accordingly, this paper identifies the research methodology adopted for the study and examines its suitability by bringing forward the theoretical underpinning related to philosophies, strategies and data collection and analysis methods. This study has been based so far on a theoretical as well as practical ideas obtained through comprehensive literature review.

2 Background to the Study

2.1 Need for women's empowerment in post disaster reconstruction

The impact of disasters has raised the concerns of affected people and has tempted the stakeholders to search for solutions. United Nations (2003) describes a disaster as a severe disruption of the functioning of a community or a society causing extensive human, material, economic or environmental losses which goes beyond the ability of the affected community or society to cope using its own resources. In order to address the various issues of the disaster and to reduce the occurrence of future disasters, it is important to take corrective measures by managing disasters in an effective way. Delaney and Shrader (2000) have acknowledged that disaster management is a circular model in which disasters and development are intertwined. According to Ariyabandu and Wickramasinghe (2003), disaster management is a collective term encompassing all aspects of planning for and responding to disasters which includes both pre and post disaster activities. Even though in disasters it is difficult to differentiate between different stages, policy makers and researchers have identified a disaster cycle for management purposes. Although different scholars use various ways of naming the phases, generally the disaster cycle includes disaster mitigation and prevention, emergency, rehabilitation and reconstruction as shown in Figure 1 (Delaney and Shrader, 2000). While each phase of a disaster cycle should not be seen in isolation (Delaney and Shrader, 2000) the construction industry should increase its focus on the right phases to build long term disaster resilient communities through reconstruction.

In the recent past, number of disaster occurrences has increased (Altay and Green, 2006). They argue that policy makers and researchers need to focus on enhancement of society's capacity to withstand disasters in order to reduce damage to both human and material resources. However, post disaster reconstruction can provide windows of opportunity for physical, social, political and environmental development not only to reconstruct the impacted areas, but also to improve the socio-economic and physical conditions of the impacted population in the long term (International Labour Organisation, 2003). The reconstruction period includes the long-term, and often substantial, investments in rebuilding the physical and social infrastructure of affected regions (Delaney and Shrader, 2000). However, in practice, too often disaster responses have not contributed to long-term development but they actually subvert or undermine it (Bradshaw, 2001; Anderson and Woodrow, 1998). This results in lengthy post disaster reconstruction activities with lost development opportunities. Therefore, there is a need to adapt strategies to increase effectiveness and efficiency in post disaster reconstruction. Previous research found that despite the improvements in the emergency response to natural disasters, permanent reconstruction is often inefficiently managed, uncoordinated and slow to get off the ground (Jones, 2006). This indicates a need to focus on post disaster reconstruction to improve disaster resistance in the long term.

The local community is an important segment of the stakeholders for disaster management as they are the first responders when a disaster occurs. Most often, during small scale disasters the local community is left to deal with disaster management without any assistance from external parties. In addition, top-down disaster risk reduction programmes often fail to address specific vulnerabilities, needs and demands of at-risk communities (Haghebaert, 2007). These vulnerabilities and needs can only be

identified through a process of direct consultation and dialogue with the communities concerned, because those communities understand local realities and contexts better than outsiders (Haghebaert, 2007). Generally, vulnerable communities possess skills, knowledge, resources and capacities and these are often overlooked and underutilised (Aldunce and Leon, 2007) and, in some cases, even undermined by external actors.

The lack of involvement of both men and women within the community in managing disasters has exposed them to more potential dangers (Childs, 2006). Further, recent studies have reflected the need for gender consideration in disaster management, and emphasised its importance in building disaster resilient communities (Ariyabandu and Wickramasinghe, 2003; Delaney and Shrader, 2000). In a study by Ariyabandu and Wickramasinghe (2003) it is emphasised that disasters affect women and men differently due to the different roles and responsibilities undertaken by them, the differences in their capacities, needs and vulnerabilities. In most of the instances, although disaster management efforts are designed to benefit both men and women, in practice a larger share of benefits and resources goes to men while women continue to remain marginalised.

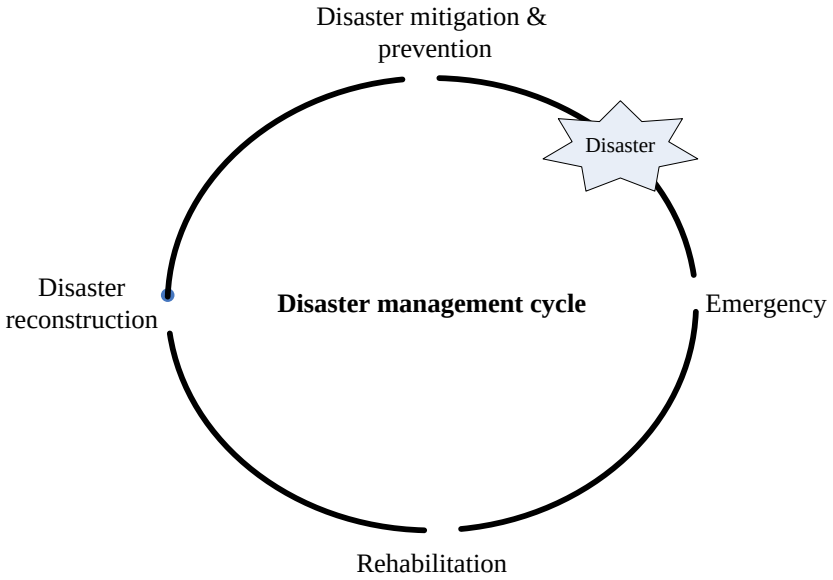

Figure 1. Disaster management cycle
(Adopted: Delaney and Shrader, 2000)

In many instances after the occurrence of disasters, women's economic dependence on men increases (Kottegoda, 2001). This ultimately reduces their security (International Labour Organisation, 2003). However, during or after a disaster as job opportunities dry up, men have the option of migrating to find work (Ariyabandu and Wickramasinghe, 2003). However, women are less able to migrate due to their domestic responsibilities, which leave them in a more vulnerable position (Centre for Policy studies, 2001; Enarson, 2001; Ariyabandu and Wickramasinghe, 2003; United Nations, 2006). During the Yokohama World Conference on Natural Disaster Reduction (1994 cited Ariyabandu and Wickramasinghe, 2003), a mid-term review of the International Decade for Natural Disaster Reduction recognised the need to stimulate community

involvement and the empowerment of women at all stages of disaster management programmes as an integral part of reducing community vulnerability to natural disasters. This bespeaks the inclusion of women's contribution to post disaster reconstruction.

In addition to poverty, environmental degradation and the different needs of men and women, the marginalised role of women within many organisations and their absence from the decision-making structures contributes to women's vulnerability in post disaster situations (Department of Economic and Social Affairs, 1999). Further, the increase in the gender based violence in affected community leaves women in a more vulnerable state (APWLD, 2006). The concept of empowerment is a management philosophy which can help to overcome these problems. The study by UN-HABITAT (2007) found that when women are empowered, they have the capacity and the inner will to improve their situation and gain control over their own lives. This can lead to an equal share in economic and political decision-making, and control of economic resources which will reduce their vulnerability in disaster situations. This reflects the strong need to empower women who are from the affected community within post disaster reconstruction to develop long term disaster resilient communities.

2.2 Aim and Objectives

The study aims to explore and investigate the implementation of the concept of empowerment for women within post disaster reconstruction in order to formulate a strategy that integrates community women's empowerment during disaster reconstruction activities. In order to achieve the aim, the study sets its following objectives.

- Understand the concept of empowerment for women
- Determine the importance of women's empowerment during post disaster reconstruction
- Identify the key factors which enable or hinder women's empowerment within post disaster reconstruction
- Explore and investigate the current practices of empowerment of women within post disaster reconstruction
- Formulate a strategy to integrate empowerment of women during post disaster reconstruction

In Sri Lanka, although the need to raise women's status has been stressed earlier, the effects of disasters on women have led many research institutions, government authorities, non-governmental organisations, etc. to heavily emphasise the need for empowerment of women (Ariyabandu and Wickramasinghe, 2003). Even though many reconstruction projects commenced immediately after the 2004 catastrophic tsunami, their poor performance and lack of involvement of women in these reconstruction activities, emphasised the need to focus on studying the empowerment of women from disaster affected communities within the Sri Lankan context. Having briefly summarised the aims and objectives of the study which forms the basis of this paper, next sections details the research methodological issues associated with the research, which in fact is the main aim of this paper.

3 Research Methodology

Research methodology is the overall approach to be used in the research process, from the theoretical underpinning to the collection and analysis of the data (Collis and Hussey, 2003). In order to explain the overall approach to the study this research adapts the nested approach by Kagioglou *et al.* (1998) as this approach maintains a better direction and cohesion of elements within research methodology. However, this section explains the detailed aspects of research methodology given by Saunders and colleagues (2007) under the 'Research onion'. This section identifies the research methodology of this study and justifies its selection among other options under three main sections: research philosophy, research strategy and, research data collection and analysis techniques.

3.1 Research Philosophy

Research Philosophy relates to the development of knowledge and the nature of that knowledge (Saunders *et al*., 2007). It contains important assumptions about the way in which the researcher view the world. Particularly, assumptions concerning researcher's view on the relationship between knowledge and the process by which it is developed play an important part for the design of research strategy and research methods. The knowledge of research philosophies can help researchers to clarify the research designs, to recognise the appropriate designs and to identify and even create designs that may be outside the researcher's past experience (Easterby-Smith, 2004). According to Saunders and his colleagues (2007) there are three main philosophical positions that underlie the designs of management research. They are Epistemology, Ontology and Axiology.

3.1.1 Epistemology

Epistemology is about what constitutes acceptable knowledge in a particular field of study (Saunders *et al*., 2007). On the spectrum of Epistemology, the most extreme positions are called Positivism and Interpretivism (Saunders *et al*., 2007). However, Easterby-Smith (2004) denotes these two positions as Positivism and Social constructionism. Within the literature authors have used different terms to explain both extremes in the spectrum of Epistemology. The main idea behind the Positivism is that the social world exists externally and its properties should be measured through objective methods rather than being inferred subjectively (Easterby-Smith, 2004). In contrast, under social constructivism, the reality is determined by people rather than by objective and external factors. Further, the in-between points in the continuum can accommodate research that needs to look into both philosophies depending on the research question. Saunders *et al*. view these as positions of the Pragmatist. Pragmatism argues that the most important determinant of the research philosophy is the research question. It is viewed that one approach may be better than the other for answering different questions (Saunders *et al*., 2007).

The research undertaken is about empowerment of women in post disaster reconstruction where the study investigates the reality on women's current status, state of the concept of empowerment and factors affecting or enabling empowerment. In this context, the reality exists in community's views on above and also it is represented in other indicators which exist externally to the social actors of the study. For example, in

order to find out what factors that have an influence on women's empowerment we need to investigate what factors that women perceive and also what are the other factors that exist externally to them such as their income, property rights, etc.. In addition, depending on its different research questions the study can take different in-between philosophical stances. This shows that this study considers the reality through a position of Pragmatist. One of the philosophical positions of the study undertaken is depicted in the Figure 2. Although the figure shows one position, in reality the study takes different positions for its different research questions within in-between points in the spectrum.

3.1.2 Ontology

The other philosophical stance, Ontology, is concerned with the nature of the reality (Saunders *et al*., 2007). This relates to the assumptions researchers have about the way the world operates. This consists of two main aspects: Objectivism and Subjectivism. Objectivism represents the position where social entities exist in reality that is external to social actors concerned with their existence. On the other hand Subjectivism holds that social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence (Saunders *et al*., 2007).

Under this study where it understands the reality through community's and experts' perceptions and also by considering the other indicators which are represented by objective data. For example, the third objective of the study, which is about identifying key factors which enable or hinder women's empowerment during post disaster reconstruction needs to investigated by considering women's perceptions on the influencing factors of women's empowerment and other factors such as women's income, resources, legal rights, etc. which are represented by objective data. Since this study deals with both subjective and objective nature of realities it falls within the extremes of Ontological positions as shown in Figure 2.

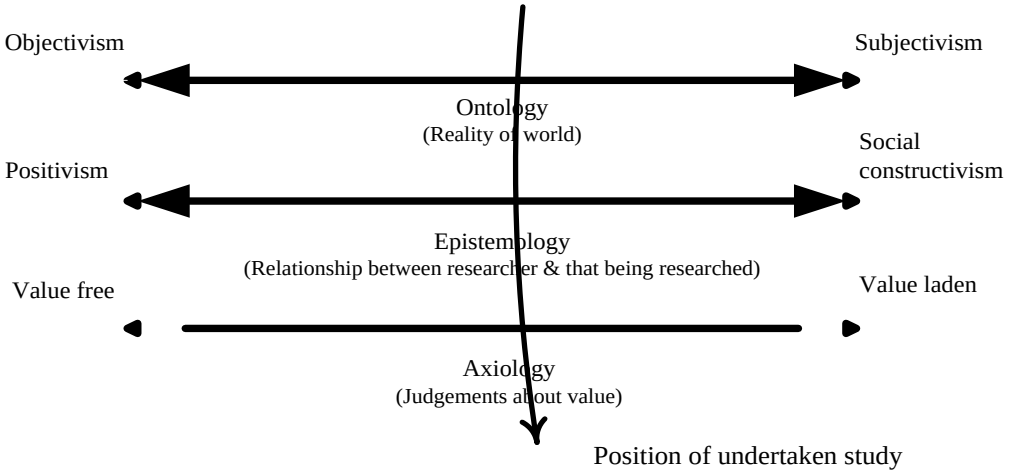

Figure 2: Philosophical positioning of the research

3.1.3 Axiology

The third philosophical stance, Axiology, is concerned with the judgements about values of the researcher. That is, whether the researcher's own values play a part in the

stages of the research process (Saunders *et al*., 2007). For example, the selection of a particular data collection technique instead of another suggests that the researcher value the selected one than the other. In this study the researcher's selection of data collection technique shows that the researcher values the use of interviews in the data collection process as it helps to capture rich information about the reality. This study leans more towards the value laden approach because the researcher needs to gather information by personal interaction and through the interpretation of the data collected.

3.2 Research Strategy

Research strategy is the research approach taken towards the data collection and analysis. The choice of research strategy is guided by the research questions and objectives, the extent of existing knowledge, the amount of time and other resources available and the philosophical underpinnings (Saunders *et al*., 2007). These strategies can be used for exploratory, explanatory and descriptive research (Yin, 2003). Although there are several research strategies these should not be considered as mutually exclusive (Saunders *et al*., 2007). As a guide to identifying a research strategy Yin (2003) proposes three main conditions: the type of research question; the control an investigator has over actual behavioural events and the focus on contemporary as opposed to historical phenomena. In addition to the above three questions, the philosophical position of the study needs to be considered while deciding the research strategy (Sexton, 2007).

Among the research strategies, this study cannot be carried out using a History strategy as it is related to contemporary phenomena. It cannot also be conducted as an experiment, as the researcher doesn't have control over behavioural events in post disaster situations. Since the study needs to gather information on people's perceptions on empowerment this cannot be conducted using only archive material. However, Survey and Case study are the two strategies that can be used to study the research problem. The research study undertaken tries to research a current problem where there is no control by the researcher over actual behavioural events and it consists of 'what' and 'how' type of research questions. Since the philosophical position of the study lies between positivism and social constructionism where it considers both the objective and subjective nature of realities, and as shown in the guidelines given in Table 1 for research questions, the survey research strategy is an appropriate approach for this study. Since actual projects on empowering women within post disaster reconstruction is unavailable in practice within the area of the study, it will not be possible to gather detailed information using Case study strategy. Hence, a better choice for gathering relevant information from different stakeholders for the study would be a Survey research strategy.

Table 1. Relevant situations for different research strategies (Source: COSMOS Corporation cited Yin, 2003)

Strategy	Form of research questions	Requires control of behavioural events?	Focuses on contemporary events?
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many/much	No	Yes
Archival analysis	Who, what, where, how many/much	No	Yes/No
History	How, why	No	No
Case study	How, why	No	Yes

Yin (2003) states that survey strategy can be beneficial when the research goal is to describe the incidence or prevalence of a phenomenon or when it is to be predictive about certain outcomes. Since this study intends to describe the prevalence of the conditions and difficulties of women in post disaster situations to seek a way to empower women, survey strategy will be appropriate to this study. In this instance, it is believed that gathering information from the affected community, that is from both men and women and other stakeholders who can play a role in empowering women such as policy makers, funding bodies, construction professionals, etc. will assist the researcher to gather more relevant expectations and outcomes of the empowerment process.

Aldridge and Levine (2001) explain survey as a way to set about gathering and analysing data. Further they state, in a survey, the same information is collected about all the cases in a sample. The concept of respondent is, the respondent is both the object and informant and will play an important role in the study. Aldridge and Levine (2001) say surveys are the prime example of extensive research techniques in the social sciences, one capable of gathering comparable information from respondents across a wide range of social groups. If the interview is well conducted in a comfortable environment and the respondent is well prepared, this will reduce the authentic nature of the survey sometimes experienced by respondents. De Vaus (2002) states that the distinguishing features of surveys are the form of the data and the method of analysis. Form of data means information that is collected concerning the same variables or characteristics from at least two cases, and which, usually, finishes with a data gird.

3.3 Research Techniques

Research techniques are the individual collection and analysis methods used for both primary and secondary data. This section deals with the specific data collection and analysis techniques used for the study under the survey strategy. Although the study is mainly based on qualitative data, it intends to gather both qualitative and quantitative using mixed methods as referred to by Saunders and his colleagues (2007).

3.3.1 Data Collection Techniques

The preliminary stages of the study mainly involve the review of literature related to the concepts of study. Further, the review of literature will continue through the study.

Primary data collection associated with this study will be based on several phases. The first phase will gather experts' opinions on women's level of empowerment, factors affecting or enabling empowerment, etc. During this phase of data collection, it is proposed to collect data through interviews and document reviews. Since the study aims to explore and investigate the implementation of the concept of empowerment for women in post disaster reconstruction by focusing on the disaster affected women from the community, the second phase of data collection will gather data from both women and men, as authors perceive men's support is an important aspect of the empowering process. Literature stresses the need to include men in empowering women as their refusal to support will result in ineffective empowerment which will ultimately lead to disempowerment of women within the community (Bradshaw, 2001; Byrne and Baden, 1995). The second phase will include multiple methods of collection such as standardised survey interviews and questionnaires and document reviews. This will assist in gathering information on the importance of empowerment, enablers and hindrances to women's empowerment and, the existing measures for women's empowerment and its problems in post disaster reconstruction.

Even though questionnaires are the most common method of data collection for survey strategy, social surveys can employ a wide range of other methods to gather information such as questionnaires, face-to-face interviews, telephone interviews, record reviews, observation, etc (Aldridge and Levine, 2001). Accordingly, in this study, in order to gather rich information related to women's and others' perceptions the study considers using open ended questions in addition to forced-choice questions depending on the required data. It is expected that the initial open ended questions asked of experts in this field, women of the community, etc. will assist in generating a picture of the most important factors and specific issues within this context and will help to gather the content for the later phase where questionnaire and interviews will be used. This questionnaire will not necessarily to be a forced-choice type, but instead it will contain both forced-choice or open ended questions. The study will be conducted using a mixture of interviews and open-ended questionnaire in order to help the researcher to gather the respondents' perspectives, allowing more options whilst not limiting the respondents' views.

3.3.2 Data Analysis Techniques

Data analysis consists of examining, categorising, tabulating, testing or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study (Yin, 2003). It is important to have a data analysing strategy as it will guide the researcher in selecting the appropriate data analysing tools, to make sure that the evidence is well handled and to generate sound and convincing analytical conclusions while discarding the alternative interpretations (Yin, 2003). In this research process, data analysis will take place in different stages in order to provide the background information in the later phase of data collection.

Piloting of the data collection and analysis will be carried out in testing the accuracy ad suitability of the methods that will be used. A pilot survey will be a dummy run of the proper survey, in which it is aimed to test all the key aspects of survey including access to respondents, design of the research instrument and gathering of the data. During the first phase of collection, data collected through interviews will be analysed using

content analysis before the commencement of the second phase of data collection. Since the study involves both qualitative and quantitative data that will be collected through interviews and questionnaires, it will consist of mixed methods of analysis.

Aldridge and Levine (2001) describe the main aims of survey analysis as the creation of illuminating accounts, persuasive narratives and plausible explanations, grounded in the survey findings, concerning the social structures, groups, and the process under investigation. This study intends to carry out descriptive statistical methods. Though survey analysis is given more importance to statistical description and inference, the imaginative analysis of survey necessarily transcend statistical reasoning.

4 Conclusion

The unequal access to resources, limited rights to decision-making and little participation in disaster reconstruction have created the need for women's empowerment in post disaster reconstruction. In order to develop long term disaster resilient communities and reduce women's vulnerability in disaster situations, it is important to empower women who are from the affected community during post disaster reconstruction. Hence, the research aims to explore and investigate the implementation of the concept of empowerment for women during post disaster reconstruction in order to formulate a strategy that integrates the empowerment of community women into disaster reconstruction activities. Since the selection of an appropriate research methodology is an important factor for the credibility of research findings this study investigates the research methodology adopted and its suitability. The research study takes a position in-between a positivism stance and a social constructionism stance in the continuum of philosophies and adapts survey research strategy with mixed method of research techniques. It is expected that the research will add empirical evidence on the process of women's empowerment in post disaster reconstruction to the existing body of knowledge.

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Capacity Building for Post Disaster Waste Management: Research Methodological Perspective

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Abstract:
Every year newspapers and television screens are dominated at some point by a natural disaster of international concern. In a disaster, generation of waste is unavoidable. This causes serious environmental and economic burden on normal living conditions, reconstruction as well as on general municipal waste collection processes. Within this context, waste management has emerged as a critical issue in responding to a disaster. This became a critical issue in Sri Lanka which was heavily affected by Asian Tsunami 2004. This was mainly due to inexperience, incapacity and lack of concentrated and effective planning and monitoring processes. In this context, it is vital to explore the capacities which need to be enhanced for effective post disaster waste management at national level in Sri Lanka. Therefore, this paper addresses research methodological aspects underpinning of this research looks into capacity building for post disaster waste management within the Sri Lankan context. Further, the paper illustrates how the philosophical issues such as epistemology, ontology and axiology directed the use of case studies as the suitable research approach. Case study design considerations associated with this research will also be discussed.

Keywords:
Capacity building, Disaster, Research methodology, Waste management

1 Background

Disasters cause a substantial damage around the world every year. A disaster is a serious disruption of the functioning society, causing widespread human, material or environment losses which exceed the ability of affected society to cope using only its own resources" (Disaster Management Centre of Sri Lanka, 2008). According to official statistics issued by the Centre for Research on Epidemiology of Disasters (CRED) and United Nations International Strategy for Disaster Reduction (UNISDR) in 2008, natural disasters killed 16,517 people and destroyed US $ 60 billions worth of property and infrastructure in 2007 (UNISDR/CRED, 2008). According to the statistical figures

although there is a reduction in impacts caused on human lives and infrastructure, the frequency of occurring disasters have increased during past years. (World disaster report, 2002, 2003, 2004)

Waste and debris (building waste) has emerged as a critical issue in responding to a disaster when compared to the extent of debris created as a result of disaster, particularly from destroyed buildings which were very significant (Joint UNEP/OCHA, 2005). This is not an exception to a developing country like Sri Lanka which was heavily affected by the Asian Tsunami in 2004 and frequent smaller disasters. Although there is a National Strategy for Waste Management in Sri Lanka it is hard to implement when a disaster occurs due to unawareness, in capabilities etc. Although, there has been many environmental awareness and education programs conducted by government as well as and non governmental organizations, with no significant progress in improving waste management issues in Sri Lanka (Kurita et.al, 2006). This causes serious environmental and economical burdens on normal living conditions, reconstruction phases as well as on general municipal waste collection process (UNEP 2005; Bandara and Patrick, 2003).

UNEP report (2005) highlights poor performance of post -Tsunami rehabilitation operations including waste management affected by a lack of responsive capacities with local government institutions to address needs of an event of such magnitude. This was mainly caused by the fact that strategic and operational level capacities of institutions responsible for public and commercial facilities were not expected to cater for a devastation of this magnitude. As such it has been identified that capacities of relevant institutions in Sri Lanka need to be improved to launch successful post disaster recovery and rehabilitation programmes and to face any future challenges similar to the Asian Tsunami (UNESCO, 2005; ADPC, 2005).

1.1 The research problem, aim and objectives

Literature revealed that there are no significant developments being made in post disaster waste management in Sri Lanka compared to other worst affected countries during the post tsunami (European Commission progress report on post Tsunami rehabilitation and reconstruction program for 2006). Further this has become a critical issue in developing countries due to lack of resources, inefficient use of available resources and lack of capacities (UNEP, 2005). Among these issues, capacity building is crucial to increase an organization's access to information and technical know-how by improving internal management structures, processes and procedures and strengthening partnerships among various players in the waste development process. Within this context this study intended to address the research question of what hinders the progress of post disaster building waste management and how can it be overcome?.

Therefore this study aims to explore the capacities that need to be enhanced for effective post disaster building waste management at National level. To achieve above aim following objectives are identified;

- Identify the status of building waste management at post disaster (Structure, relationships, stake holders, statistics)

- Explore the strategies adopted in post disaster building waste management during *past five years*. (2004 onwards)

- Determine key factors that hinder the progress of building waste management at post disaster scenario

- Critically evaluate the key factors that affect the capacity building at national level.

- Develop a *generic* framework to *guide* to enhance capacities at national level

1.2 The Scope of the Paper

This paper primarily based on the secondary data findings and more focused on the research methodology is going to adopted to conduct the research fulfilling the aim and objectives identified above. The structure of the paper consists of background to research, aim & objectives, research methodology and conclusions to conclude the paper.

2 Research Methodology

Leddy (1997) remarks that "the word research is used in everybody's speech to cover a broad spectrum of meaning, which makes it decidedly a confusing term". However, research is often described as "the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon with which we are concerned or interested (Collis and Hussey, 2003; Remenyi et al, 2003; Tan, 2004). Ultimately main intention of any research is to add value to the accumulated knowledge through the means of identifying, investigating and producing solutions to an unsolved problem (Remenyi et al, 2003)

Every research project invariably requires careful and appropriate planning and execution by the researcher. No matter how unique a research problem or project is, there are a number of common steps in the process that are relevant to most research projects. There are many factors which determine the most appropriate methodology. A methodology refers to the choices we make about cases to study, methods of data gathering, forms of data analysis etc., in planning and executing a research study (Silverman, 2006). According to Remenyi et al (2003) the topics to be researched and the specific research question are the primary drivers in choice of methodology. Gobo (2004) suggests that a methodology compromises of a preference for certain methods, a theory of scientific knowledge, a range of solutions and procedural steps.

In order to select the most appropriate methodology it is important to understand the philosophical underpinning of a research. Following section justifies philosophical stand for the study and the research methodology adopted for the research under consideration.

2.1 Research philosophy

According to Saunders et al, hierarchical model of research methodology guides and energizes the research approaches and strategies. The research philosophy contains of

important assumptions about the way in which the world is viewed (Saunders et al, 2003). Further, these assumptions underpin the research strategy and methods that one chooses as a part of the strategy. Easterby-Smith et al (2002) state that failure to understand and think through philosophical issues can have a detrimental effect on the quality of research outcome. He further states that it enables a researcher to resolve research questions by identifying, adopting or even creating research designs that project beyond ones own experiences and knowledge.

The key variables which explain research philosophy are epistemology, ontology and axiology (Collis and Hussey, 2003; Saunders et al, 2003). In general, epistemology describes reality and assumptions about knowledge in the field of study; ontology is concerned with nature of reality and axiology is about assumptions on the value system. These will help to position a research within philosophical continuum.

In terms of epistemology, positivism and social constructionism can be placed at the two extreme ends of the continuum. Positivists argue that "the world exit externally and that its properties should be measured through objective measures rather than being inferred subjectively through sensation, reflection or intuition" (Easterby-Smith et al, 2002). In contrast, social constructionism states that reality is determined by people rather than by objective and external factors (Easterby-Smith et al, 2002).

This study intended to identify factors that enable capacity building of waste management processes in a post disaster scenario. Particularly, these key factors need to be identified through co-operation of stakeholders, victims, community groups etc. This illustrates that a researcher need to be part of the environment and interaction is needed to identify different views of people. In this context, social constructionism approach can be identified as the most appropriate to this research when compared to positivism.

In an ontological assumption, a researcher must decide whether to consider the world as external to the researcher or is socially constructed, understood by examining human perceptions. The first aspect is realism (objectivism, nomothetic) and the second is idealism (subjtivisum, ideographic). (Collis and Hussey, 2003; Saunders et al, 2003). Realism is based on methodologies of systematic protocols and techniques which focus on testing hypothesis, while idealism emphasis on analysis of subjective matters by getting involved in everyday activities. As previously discussed, this research will analyze subject matters by being a part of the environment. In addition, development of key factors for this research is based on generation and use of qualitative data. Hence, it can be seen that by its nature, this research is tilted more towards idealism than realism.

As an aspect of research philosophy, axiology is considered on facts whether reality is value free or value driven. In a value neutral research, what to study and how to study can be determined by an objective criterion, whilst in value laden research, it may be determined by human belief and experience (Easterby-Smith et al, 2002). In terms of axiological thinking, this research takes a value laden stance.

In summary, with reference to research philosophy, this research can be classified within social constructionism in term of epistemological undertaking, idealism under ontological and value laden under axiological assumptions.

2.2 Research strategy

There are various research strategies where research can be based upon (Yin 2003; Saunders et al, 2003; Easterby-Smith et al, 2002; Gill and Johnson, 2002). A research strategy may be described as the approach to research including by which it is conducted. According to Yin (2003), type of questions posed, extent of control an investigator has over actual behavioral events and degree of focus on contemporary as opposed to historical events are the three conditions that govern selection of an appropriate research strategy. In addition, target groups, time, funds and competency and capacity of researchers will also guide choice of a research strategy (Tan, 2004). The literature reveals experiments, surveys, case studies, ethnography and action research as major strategies. (Yin 2003; Saunders et al, 2003; Easterby-Smith et al, 2002; Gill and Johnson, 2002).

According to literature, experiments and surveys are undertaken on a sample or wider population within a controlled environment to test casual relationships between variables under consideration (Baker, 2001; Saunders et al, 2003). Further, according to Sexton (2003) experiments and surveys take positivism and realism positions in terms of epistemology and ontology. Since this research is tilted towards social constructionism and idealism with regard to philosophical stance, uses of above strategies are not appropriate.

Therefore, the researcher has to make a choice among case studies, action research and ethnography. Ethnography provides a researcher with insight into beliefs and values of human, social and organizational aspects of socio cultural phenomenon while in an action research; a researcher will be a part of environment under study tries to solve practical problems and tries to change studies and behavior of participants (Harvey and Myers, 1995; Waser and Jones 2003). Research under consideration does not intend to influence or change attitudes or procedures of participants or environment as well as it does not intend to study behavioral patterns or physiological aspects. Hence the use of case studies as the research strategy is more favorable than others for the research under consideration.

The case study is an empirical inquiry that investigates contemporary phenomena within its real life context; especially where boundaries between phenomena and context are not clearly evident. (Yin 2003).This research intends to identify key enabling factors for capacity building in waste management processes by giving consideration to projects which are initiated as the results of management of disaster waste as the multiple units for case of post disaster building waste.

In addition, this also intends to identify strategies adopted for waste management, issues encountered when adopting, key factors hindering progress of waste management processes etc. As discussed previously, Yin 2003 states that nature of research questions pose an effect on the research strategy. According to Yin “why” and “how” questions are favor the use of case studies and the use of “what” question turn the case studies towards an exploratory case studies. Since this research is associated with “what” type of question *(research question: what hinders the progress of post disaster building waste management and how can it be overcome?***)** this is inclined more towards adoption of exploratory case studies as research strategy. Further, case studies provide

an opportunity to deal with a variety of evidences such as documents, interviews and observations (Yin 2003). The design of a case study is elaborated in the following section.

2.3 Case study design

Yin (2003) argues that development of a research design is a difficult part in case studies. A research design is the logic that links data to be collected to drawn conclusions to initial question of study. (Yin 2003). According to Yin case study designs can be categorized into four types of designs as single case (holistic), multiple cases (holistic), single case (embedded) and multiple cases (embedded).

With relevance to holistic versus embedded, this research involves one unit of analysis, building waste. Accordingly, this research will adopt the multiple cases (holistic) case study design. Further, Yin highlighted the impotence of quality of research design and introduces four components commonly used in social research to judge quality of design as construct validity, internal validity, external validity and reliability. External validity deals with the problem of knowing whether the findings can be generalized. Although this research is single case by using replication logic in multiple case studies will satisfies the external validity. Next section will provide more information on other three design tests along with research techniques.

2.4 Research techniques

Having identifying the research philosophy and strategy, the next step is to determine an appropriate research technique for the study. Research techniques refer to methods used to collect and analyse data. Following section discusses data collection and analysis techniques used within this research (multiple cases, holistic) with the design tests, respectively.

2.4.1 Data Collection

According to Yin (2003) incorporation of multiple sources of evidence, creating case study databases and maintaining a chain of evidence will increase quality and substantiality of a case study. Further, six main sources of evidence which can be used in case studies are, data collection as documents, archival records, interviews, direct observation, participant's observations and physical artifacts.

In this research, documents and semi structured interviews comprise of main sources of data collection. These interviews will be more towards an open ended nature where respondents are free to come with their own opinion about events in addition to facts of the matter. These informal discussions will give added value to quality of the data collected. Through interviews on waste management strategies, data on barriers associated with each strategy and factors hindering progress of waste management processes will be gathered from among public, private and non government organizations and community groups.

According to Yin (2003) construct validity and reliability are tested during the data collection phase. Further, he states three tactics which are available for increase of construct validity as use of multiple sources of evidence, establishment of chain of evidence and draft case study review by key informants. In term of reliability, it is

stated that by having a case study protocol and developing a case study database will enhance reliability. Since the research is using multiple sources of evidence (documents and semi structured interviews) to collect data it will immensely increase the construct validity of this research. The database will be developed to store and retrieve information collected thorough aforesaid sources of evidence in a user friendly manner and relevant protocols associated with interview guidelines in the case study will be followed to increase reliability of the research.

2.4.2 Data analysis

The analysis of case study evidence is one of the least developed and most difficult aspects of the research. Data analysis consist of examining, categorizing, tabulating, testing or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of the study (Yin, 2003). Further, Yin states that conducting case study analysis need to have general analytic strategy as it will guide to select appropriate data analysis tools to make sure that the evidence is treated well to generate sound and convincing analytical conclusions. Three generic analytic strategies are theoretical propositions, rival explanation and case description. Since in this research, the objectives and questions are developed through identification of theoretical propositions, this will rely on theoretical propositions analytical strategy.

Several analytic techniques are available for achieving high quality case study outcomes such as; pattern matching, explanation building, time series analysis, logic models and cross case synthesis. This research data analysis is expected to be carried out by using the pattern matching techniques which compares an empirically based pattern with a predicted one (Yin 2003). Through this internal validity of the case study can be strengthened. Further, data collected through semi structured interviews will be analyzed using content analysis methods. Content analysis is a method that compresses many words into a fewer content categories. According to Silverman (2006) this involves establishing categories and then counting the number of instances that fall into each category. This method pays particular attention to reliability of its measures and to the validity of its findings. Cognitive analysis will be used to identify the relationships of waste management process in Sri Lankan context and modeling tools will be used when developing the frameworks.

3 Conclusion and Further Research

The generation of waste at post disaster scenarios would not be avoidable at all. Among many other issues, post-disaster waste management is a key owing to capacity constraints of available resources including lands, expertise, funds and technology. Further, poor coordination and lack of communication led this to more critical status. Within this context, this paper highlighted the importance of building capacities in post disaster waste management at national level and the extensive discussion on research methodology which is going to adopt in fulfilling the identified aims and objectives of a study and thereby addressing the research problem. The investigation of disaster waste management at post disaster scenario revealed with reference to research philosophy, this can be classified within social constructionism in term of epistemological undertaking, idealism under ontological and value laden under axiological assumptions. The aforementioned philosophical understandings and need of carrying out an in-depth

analysis without interfering to the research environment led the way to select case study as the most appropriate research approach. It can be concluded that the proper understanding of the philosophical issues followed by a clear definition and design of research strategy are essential elements in developing successful research. The philosophical understanding of the research ensures the compatibility and consistency between research philosophy, approach and techniques while the clear definition and design of research strategy would generate unbiased and more convincing research outcomes. As the future developments, this study will enable us to identify the key enabling factors that could be applied to improve capacities at national levels that lead to optimize sustainable use and management of post disaster building waste in Sri Lanka.

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Strengthening Post Disaster Reconstruction through Capacity Building: A Literature Review

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Abstract:
Disasters cause substantial damage around the world every year. While there are usually preventive measures that can be implemented to mitigate loss of life, it is often not economical to avoid damages to infrastructure and building or to insure entirely against loss of life through disasters. Thus the recovery from disasters is a challenge and the demand for effective post disaster response will accordingly increase. It is vitally important to look in to reconstruction phase so as to improve the effectiveness and efficiency of response. In this context, capacity building aims to increase an organization's access to information and technical know-how by improving internal management structures, processes and procedures as well as strengthening partnerships among various players in the development process and it has been identified that there is a need to generate a focus on capacity building in disaster management. In this context, the objective of this paper is to discuss and explore the problems associated with post disaster reconstruction and to explore how to enhance the capacity of organizations and people concerned so as to strengthen the reconstruction process. The research methodology includes a comprehensive literature review on post disaster reconstruction and capacity building.

Keywords:
Disasters, Disaster Management, Reconstruction, Capacity Building

1 Introduction

Disasters, both natural and man-made, have been occurring with increasing frequency and effect in recent decades in many countries around the world and they cause widespread human, material and environmental losses.

A typical post disaster situation has three phases of recovery as humanitarian relief, rehabilitation and reconstruction. Reconstruction involves, restoring the basic infrastructure and services that the people need so that they can return to the pattern of life which they had before the disaster. Further it is considered as an important stage in disaster management where it provides an opportunity for the community's development. But in real practice, it found to be the reconstruction is poor in its

effectiveness and efficiency compare to short term relief and affected communities experience a prolonged transitional period leading to an unsettled society. Therefore addressing post disaster reconstruction phase is a timely issue so as to minimize the failures.

Concept of capacity building has received a great deal of attention over the last few years and there is a great demand for capacity building within and beyond the recovery efforts. Generally the term capacity implies the ability of people, institutions and societies to perform functions solve problems and set and achieve objectives. Thus the capacity building involves the development of disaster-management capacities within the whole system, which comprises the local, national, regional and international levels. This would ensure a coherent and comprehensive effort as well as the establishment of a broader enabling environment. On the other hand, though there are usually preventative measures that can be implemented to mitigate loss of life, it is often not economical to avoid damage to infrastructure and buildings, or to insure entirely against loss of life through disasters. In the light of this, strengthening capacities can be identified as a main priority.

Thus the objective of this paper is to present the findings of a comprehensive literature survey carried out in post disaster reconstruction and capacity building.

2 Literature Review and Findings

2.1 Disasters

A disaster is a serious disruption of the functioning of a society, causing widespread human, material, or environmental losses which exceed the ability of affected society to cope using only its own resources (DMC, 2007). The Centre for Research on the Epidemiology of Disasters (CRED, 2004) defines a disaster as a "situation or event, which overwhelms local capacity, necessitating request to national or international level for external assistance". Disasters are often classified according to their speed of onset (sudden or slow), or according to their cause (natural or man-made). Natural disasters include floods, droughts, earthquakes, cyclones, hurricanes, tornadoes, typhoons, landslides, volcanic eruptions etc and manmade disasters include chemical accidents, oil spills, radiological accidents, armed conflicts, communal riots, fires etc (Srinivas, 2004 and Jayaraj, 2007). The magnitude of disasters is documented by reference to the degree of vulnerability of the affected population.

Disasters cause substantial damage around the world each year and bring about the loss of lives, property, employment and damage to the physical infrastructure and the environment. There has been an increase in natural disasters and their impact over the past few years. In 1998 World Bank estimated that natural disasters killed over 50, 000 people and destroyed US $ 65 billion worth property and infrastructure (Ofori, 2002). According to statistics issued by the Centre for Research on Epidemiology of Disasters (CRED) and United Nations International Strategy for Disaster Reduction (UNISDR) in 2006, natural disasters killed 91,963 people and destroyed US $ 159 billion worth of property and infrastructure in 2005 (Karunasena et al., 2008). The Annual Disaster Statistical Review 2006 (Keraminiyage et al., 2008) highlights that the number of natural disasters that occurred in the period 1991 to 1999 varied between 200-250, while

the figures have almost doubled during the period 2000 and 2006. The frequency and impact of disasters in the developing countries is greater than industrialized countries (Ofori, 2002 and RICS, 2006). IRP (2005) stated that the great part of natural disasters' victims worldwide is in developing countries.

2.2 Disaster Management Process

Disaster management efforts aim to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims, and achieve a rapid and effective recovery (Warfield, 2004). Central Emergency Relief Organisation Disaster management (2004, cited Karunasena *et a., 2008l*) introduces disaster management as a "collective term encompassing all aspects of planning for and responding to disasters, including both pre- and post-disaster activities"

The process of disaster management is presented as a two phase cycle as shown in Figure 1. The main phases are pre-disaster risk reduction phase and post-disaster risk recovery phase. As Warfield (2004) states, the disaster management cycle illustrates the ongoing process by which governments, businesses and civil society plan for and reduce the impact of disasters, react during and immediately following one and take steps to recover after it has occurred.

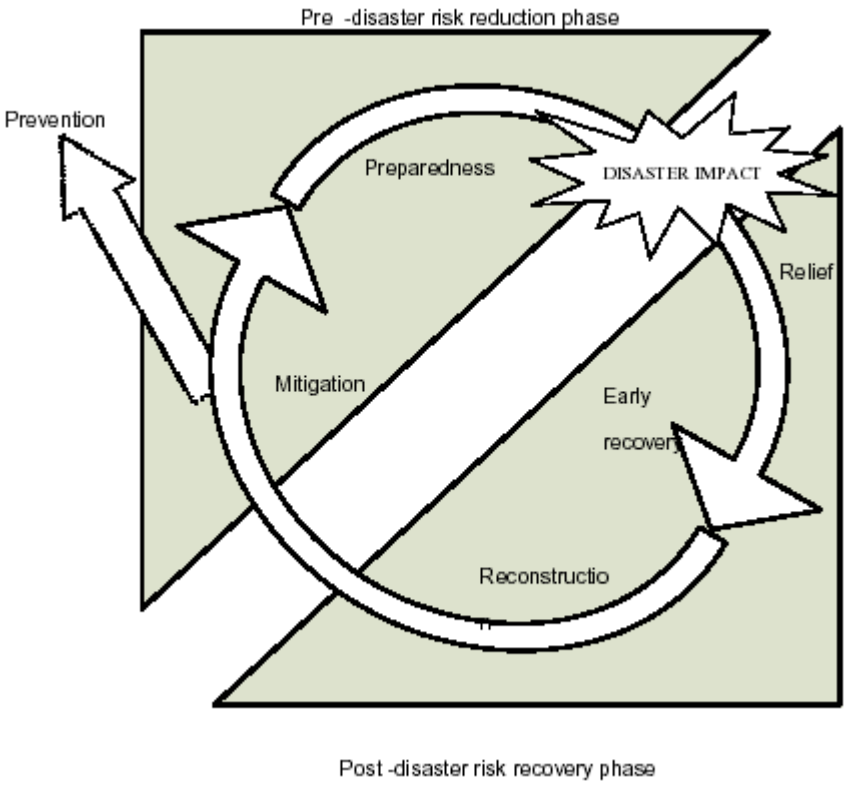

Figure 1: Disaster Management Cycle
(Source: RICS, 2006)

2.2.1 Pre Disaster Risk Reduction Phase

The pre-disaster phase of the disaster management cycle includes both mitigation and preparedness. Disaster mitigation refers to any structural and non-structural measures undertaken to limit the adverse impacts of natural hazards, environmental degradation and technological hazards (RICS, 2006). Jayaraj (2007) identifies mitigation as actions taken to reduce risk. Mitigation measures may eliminate or reduce the probability of disaster occurrence, or reduce the impact of unavoidable disasters on people and the environment. Hence mitigation measures are cost effective and long-term result oriented. Jayaraj (2007) describes about three different types of mitigation measures as structural, non-structural and agricultural. Strengthening of unsafe building comes under structural mitigation while legislation, training, educational measures for public awareness, soil conservation, reforestation, etc., are termed as non-structural mitigation. Agricultural measures include introducing appropriate crops and breeds of livestock's, drought resistance practices, etc.

Disaster preparedness means predicting, responding to and coping with the effects of a disaster through planning and preparation (Jayaraj, 2007). Even though there is a close relationship between preparedness and mitigation, preparedness planning deals more with the short term in such a way as to minimize casualties and further damage compare to long term mitigation measures. This covers training in evacuation, setting up systems to operate in emergencies, establishing an emergency operations centre, stockpiling of emergency supplies and making an evacuation plan for a community living closer to a source of disaster.

2.2.2 Post Disaster Risk Recovery Phase

Relief, rehabilitation and reconstruction are commonly identified within the post-disaster phase that is the period that immediately follows after the occurrence of the event. Rescue phase usually lasts for the first 48 hours after a disaster when the rate of survival of trapped victims is high (ADRC, 2005). Rescue operations continue for much longer duration, however, after the first 48 hours, the resources allocated for rescue are comparatively low since other priorities take over.

Relief phase followed immediately after the rescue phase. During the relief phase, the focus is on providing basic necessities to victims. Detailed assessment of human and other losses is also usually carried out, which helps in optimal allocation of resources. Relief phase may last between 1 to 3 months depending on the severity of the disaster. The rehabilitation phase is also known as restoration, transitional phase or early recovery phase. This involves the actions taken following a disaster to restore basic services to enable the affected population to return to pre disaster conditions. 'Reconstruction' involves helping to restore the basic infrastructure and services that the people need so that they can return to the pattern of life which they had before the disaster (Davis, 2005). The medium term plans of the recovery process are building housing units, restoration of the lifelines and infrastructures, while the long-term objective is to build a safer and sustainable livelihood.

2.3 Post Disaster Reconstruction

Post disaster reconstruction is considered as an important stage in disaster management where it provides an opportunity for the community's development. By proving this RICS (2006) states that disasters and development are inextricably linked, and disaster recovery presents an opportunity to make things better than before: 'reconstruction-plus. Further Jayaraj (2007) reinforced this and mentioned, reconstruction phase provides an opportunity to introduce new modes of organizing a community and reducing vulnerability to hazards.

Despite this, many are concerned on other phases and reconstruction remains neglected. RICS (2006) claims that although there have been improvements in the emergency response to natural disasters, permanent reconstruction is often inefficiently managed, improperly coordinated and slow to get off the ground. Go into further they describe that humanitarian relief is built around an international infrastructure of national, international and inter-governmental organizations compare to long-term recovery, which, is primarily a national, sub-national and local government-led matter. Capacity at local government level to plan and implement recovery strategies is usually very limited and often incapacitated as a result of the disaster and thus specially the developing countries are often fail to implement successful disaster recovery programmes.

Effectiveness of the post disaster reconstruction constrained broadly by the lack of financial and intellectual capacities and described further as follows;

Lack of planning, coordination and management: Post disaster reconstruction needs a great deal of coordination between various parties, planning of appropriate actions and management of the work. For example, excessive money spent on emergency shelter as a result of poor planning may lead to inadequate finance for reconstruction (Provention/ALNAP, 2005 cited RICS, 2006). Recent study conducted in Sri Lanka found that some tsunami victims are not willing to settle in newly built areas as they were constructed without giving due consideration to the livelihoods of them and infrastructure availability (Keraminiyage *et al.*, 2008). This again demonstrates the lack of planning, coordination and management skills of the relevant authorities.

Lack of finance: Most donors prefer to fund short term relief actions and allow fewer funds for long term recovery actions. Problems associated with aid utilization and accountability also must be urgently addressed (Jayasuiya *et al*, 2006). Further the reconstruction going to be costly due to the material price increasing and shortage of skilled labour. As oppose to this, reconstruction should maximize the use of locally-sourced materials, including, in particular, recycling the debris of the disaster and local human resource

Institutional constraints: Institutional constraints exist within organizations involved in reconstruction and encompass poor communication, lack of information, rigid policies on funds and decision making.

Absence of a culture of preparedness: This critically determines the scale of the impact. Knowing how to respond can reduce the impact and problems of recovery

Reconstruction is often associated with large sums of money. Damage from the Indian Ocean tsunami is estimated around $10 to $11 billion and about 80% of it is related to the reconstruction efforts (TRN, 2005, cited RICS, 2005). Even though there are usually preventative measures that can be implemented to mitigate loss of life, it is often not economical to avoid damage to infrastructure and buildings, or to insure entirely against loss of life through disasters. All these demand for effective post-disaster responses. Importance of capacity building is identified within and beyond the recovery phase. Strengthening the local capacities is affirmed to minimize the ineffectiveness of the reconstruction process (UNDP and MDMHR, 2006).

2.4 Capacity Building

The concept of capacity building has received a great deal of attention over the last few years. UNDP (2002, cited DFID, 2007) defines the capacity as "the ability of people, institutions and societies to perform functions, solve problems, and set and achieve objectives". Buckle et al (2003) introduced capacity as, the ability to access skills, knowledge and resources and to apply effectively.

Capacity building is a complex notion and it involves individual and organizational learning which builds social capital and trust, develops knowledge, skills and attitudes and when successful creates an organizational culture which enables organizations to set objectives, achieve results, solve problems and create adaptive procedures which enable it to survive in the long term (DFID, 2007). In the technical field of disaster risk management, according to the definition provided by UN/ISDR, capacity building involves those "efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk. In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society" (IRP, 2005). It further states that capacity building should involve the development of disaster-management capacities within the whole system, which comprises the local, national, regional and international levels and adoption of such a systemic approach would ensure a coherent and comprehensive effort as well as the establishment of a broader enabling environment.

2.5 Addressing Reconstruction Gaps through Capacity Building

Following sections discuss the circumstances/situations where capacity building can play an important role to minimize existing ineffectiveness of the reconstruction phase. Focus is given on various stakeholders involved in post disaster reconstruction.

2.5.1 Government, National Institutions and Local Institutions

As discussed earlier, states that are poorly-developed and weakly governed, are particularly exposed to the impacts of natural hazards and are lack in successful recovery. Vice versa, it is widely recognized that when the disaster affects strong national governments with well-developed national institutions and functioning legal frameworks, relief efforts are always more successful and can set a solid ground for recovery (IPR, 2005). As visualized in Figure 2, government and community are the major mediators of the recovery phase and NGOs and International organizations are next in intervention. Hence recovery efforts are going to be sustainable only with

government-community participation as NGOs' and international organizations' role is reduced after a certain period (ADRC, 2005). Therefore to peruse a successful recovery, it is required to strengthen the capacities of government, national institutions, local institutions and community.

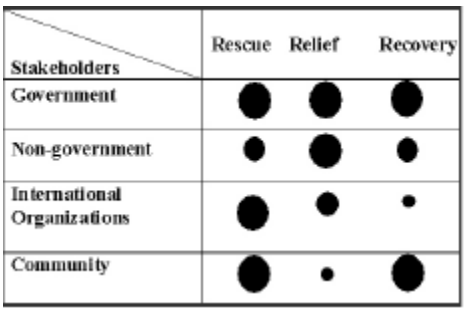

Figure 2: Idealized level of interventions of different stakeholders
(Source: ADRC, 2005)

Financial and Human Resource Gaps: Lack of finance and lack of capacity to spend them are both crucial gaps identified in the recovery phase. Problems with aid utilization and accountability must be urgently addressed to avoid the mismanagement of funds. Increased cost of construction which is often apparent during reconstruction can be reduced through minimizing the cost of material and labour. The locally existing, ecologically friendly, low cost materials should be made use of and efforts should be made to make use of the old and useful building materials and thereby avoiding wastage. The labour intensive technology should be encouraged while implementing programmes to develop skills of labourers to eliminate the problem of labour shortage and thus higher labour rates occurring in reconstruction phase.

Planning and Management Skills: Planning and Management skills should be enhanced to avoid slow and uneven progress of reconstruction activities and to maximize the successful resettlements. New forms of telecommunication and the use of satellites are increasingly important in helping planning and co-coordinating recovery and reconstruction (RICS, 2006).

Technical Skills: Programmes should be developed to facilitate skill development, up-gradation of traditional skills and encourage learning by doing.

Institutional gaps: Capacity of national actors to respond promptly to a crisis should be addressed. Such as; lack of predictable human, financial and physical resources to be immediately deployed, lack of common analysis and assessment tools and methodologies; defining roles, responsibilities and mechanisms of immediate intervention. Other than that, in post disaster conditions communications are often poor and information is a scarce resource, but more widespread and intelligent use could be made of community-led surveys and independent monitoring by local civil society organizations which, with appropriate professional support, could fill the gaps (RICS, 2006). More importantly, coordination is needed amongst all the actors involved: between local, national and international institutions; between governmental and civil society organizations and, between civilians and military forces. Coordination in relation to recovery efforts is found to be a critical issue, in order to ensure that relief

and recovery plans match the existing needs and that the different actors of national and international have the capacity to intervene appropriately. Adequate training to the staff involve with reconstruction is essential to enhance the coordination skills.

Awareness Programmes: Education of the public regarding the government relief available, through pamphlets giving information regarding the various relief measures announced by the government is needed to enhance the awareness of public.

2.5.2 NGOs and International Organizations

Short term financing: Lack of finance is one of major capacity gap exists in post disaster reconstruction. As discussed earlier more funds are allocated on short term relief programmes compare to long term recovery. Donor organizations should therefore achieve the appropriate balance of fund allocations between the immediate/short term relief and the medium/long term recovery. The donor organizations such as UN have recently recognized this aspect as a timely priority (UNDP, 2006). At the same time, international organizations and governments should work together to strengthen accountability mechanisms in recovery and reconstruction phases.

Rigid policies on finance: The modalities of aid spending, including procedures and mechanisms need to be reviewed to improve quick and effective responses opposed to their rigid policies and decision making on funds release.

Institutional Gaps: It was found that NGOs and International organizations are lack in Coordination and communication and thus are needed to be enhanced. Communication channels are required to be well organized and used, to provide support for a greater collaboration and coordination amongst local/national task forces.

3 Research Methodology

A comprehensive literature survey and review was carried out as the methodology by referring reports, journals, articles and conference papers. Hart in 1998 defined a literature review as ‘’the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfill certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed’’. According to Blaxter et al. (2006) the purpose of the literature review is to locate the research project, to form its context or background, and to provide insights into previous work (cited Ridley, 2008). Further Ridley in 2008 described the importance of literature review as it supports to explore the field in which you are going to do your research and gain a thorough awareness and understanding of current work and perspectives in the area so that you can position your own research clearly on the academic map of knowledge creation.

4 Discussion

Disasters cause widespread human and environmental losses around the world frequently. Statistics prove that there is an increment of natural disasters and also damage caused by them over the past years. Going further it was found that developing

countries are particularly exposed to disasters compare to developed countries. All these facts were demand for effective management of disasters so as to avoid or reduce the impact of disasters while insuring prompt and appropriate assistance to victims and to achieve rapid and effective recovery. Adhering to this aim, disaster management cycle is formed, identifying two main phases as pre disaster risk reduction phase and post disaster risk recovery phase. While 'mitigation' and 'preparedness' were commonly identified under pre disaster risk reduction phase, some differences were found in relevant to post disaster risk recovery phase, especially in terms of terminologies used. For example, in some instances, post disaster phase is described with relief, transitional and long term recovery while some were identified it as relief, rehabilitation and reconstruction. That is mainly because those terms were not commonly defined within the scenario of disaster management. However with reference to the core contents it was identified that 'rehabilitation', 'transitional' and 'early recovery' carries similar meanings while it was the same for 'reconstruction' and 'medium/long term recovery'.

It was understood that total elimination of damages from disasters is not possible and thus risk recovery phase remains important. Similarly it was found that long term reconstruction is ineffective and lagging behind compare to short term relief phases. This demands attention as reconstruction is known as which enables people to return to their original pattern of lives.

Analysis of failures suggests that reconstruction is mainly constrained by lack of financial and intellectual capacity gaps of main stakeholders of post disaster reconstruction phase. Thus to cope up with these challenges or gaps of reconstruction it is essential to build up the capacities of these stakeholders, which is known as 'capacity building'. Amongst the stakeholders it is identified government, including national and local institutions and community are as major mediators of recovery phase compare to NGOs and International organisations which placed next. Therefore it is emphasized to identify and strengthen the capacities of government, community, NGOs and International organisations in respective priorities. Governments, national and local institutions are found to be incapacitated in financial, human resource, planning and management, technical skills and institutional skills. NGOs and International organisations are expected to enhance their capacities in financial and institutional skills. While governments should avoid the mismanagement of funds NGOs and International organisations are expected to achieve an appropriate balance of fund allocations between short term and long term together with flexible policies to flow money from top to bottom levels. All stakeholders should enhance their coordination and communication skills.

Question of how the capacity should be built, need to address through further research and based on the literature findings author suggest that qualitative level data collection through interviews would support to fulfil the research aim of minimising gaps in reconstruction. In depth analysis of stakeholders in terms of their involvement in reconstruction and prioritising their gaps should be carried out in precedence to data collection.

5 Conclusion

Objective of this paper was to explore and present the findings of a literature review carried out on strengthening post disaster reconstruction through capacity building.

Disasters have been occurring with increasing frequency and making high impacts on human, social, physical, environmental and economic. Due to this, it has become a major area of research within the built environment. In generally disaster management process is visualised as a cycle with a pre disaster risk reduction phase and a post disaster risk recovery phase. Pre disaster risk reduction phase includes mitigation and preparedness while relief, rehabilitation and reconstruction identified within post disaster phase. While both the phases are equally important, it is understood that total prevention or elimination of risk is not possible and economical. Therefore recovery remains vital important. Past experiences were shown that the reconstruction is lagging behind compare to relief and rehabilitation phases of recovery, making crucial effects on people affected. Lack of finance, planning, coordination, management, institutional constraints and absences of a culture of preparedness were amongst failures identified.

Capacity building is identified and accepted as a good response for minimizing the effect of above issues through capability building of all the actors of reconstruction including government, national institutions, local institutions, community, NGOs and International organizations. As major mediators of the reconstruction phase, government, national institutions, local institutions together with community should be enhanced their capacities on financial, human resource, planning and management, institutional constraints and awareness programmes. International organizations and NGOs must look into the capacities of financing and financing related policies together with some institutional capacities of coordination and communication.

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Capacity building through appropriate technology transfer in community housing in Nigeria

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Abstract
Changing expectations on the role of the state, non-governmental organizations, other development agencies/institutions and civil society in promoting capacity building through appropriate technology transfer has been apparent in many development literatures. Coupled with shifting expectations of NGOs to be the "Magic bullet" to fix some of the on going developmental problems (Edwards and Fowler, 2002). Capacity building is an important strategy for fostering sustainable social, political and economic development and grass root communities have been said to be important section of the community capable of transforming the state and society (Fisher, 1997). Hence, the reason many NGOs work with marginalised communities who have been marginalized by the market or deprived of social infrastructure. Previous research to date has tended to focus on NGOs as organisations. However, far too little attention has been paid to how such strategies and organisation could fit with the communities. This paper proposes that many development initiatives by NGOs are hindered by inadequate interaction between NGOs and the beneficiary communities. The paper argues that as well as well designed projects, it is also important to adequately interact with the communities in order to get them involved in development projects which have proved to be a major problem in development projects. This paper gives a synthesis of literature review. The reason for the literature review is to have an in-depth understanding of this phenomenon. This study is important because, firstly, it adds to existing literature and secondly it informs the importance of NGOs on the effectiveness of capacity building through appropriate technology transfer.

Keywords: Non Governmental Organization, technology transfer, Nigeria, capacity building, development.

1 Introduction

The relevant literature on development studies has attempted to identify and address the fundamental causes of global poverty (Kremer and Miguel, 2004). These attempts include development policies from institutions such as the World Bank and

International Monetary Fund (IMF). Some of these approaches have been said to have not performed as it should. This is mainly because the top-down strategies, which are strategies from institutions down to the communities, has been blamed for the past failures of development programmes largely due to the exclusion of the people that the development projects or programmes are designed for (Ukpong, 1993). As a result of the unsuccessful development strategies and a reaction to the top-down process of development processes, the bottom-up approach which seeks the active involvement and participation of communities in the development process was introduced (Lewis, 2001).

The objective of this paper is to identify the roles, responsibilities and scope of work of non governmental organization and its stakeholders. This will illustrate how these roles and responsibilities of stakeholders hinders or enables the effectiveness of the interaction to build self-sustaining capacity to transfer, absorb and use building technologies in indigenous housing. Figure 1 shows the interaction between DNGOs and communities.

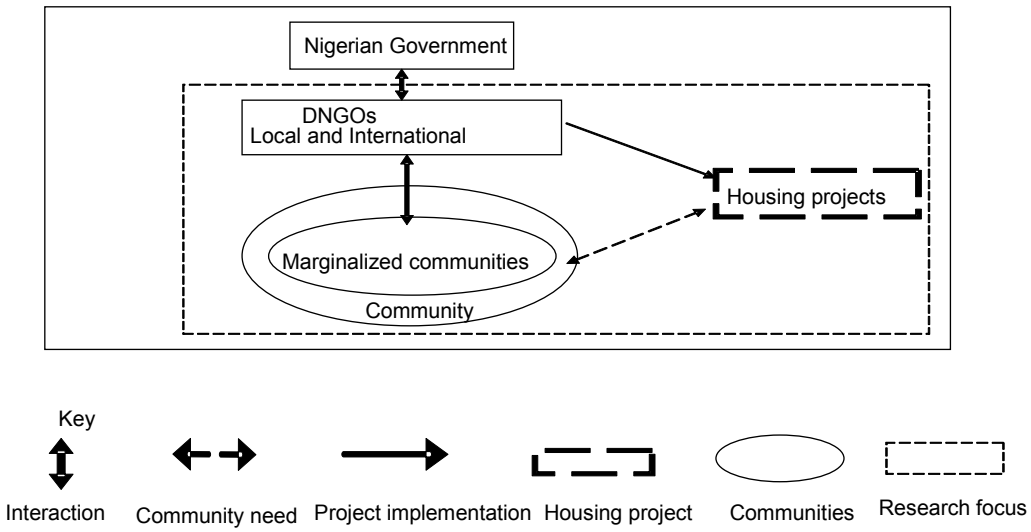

Figure 1: The interaction between DNGOs and communities in Nigeria housing project

For the purpose of this paper, NGOs acronym will stand for Non governmental organization and it is construed to mean independent, non profit, developmental, voluntary organization operating at the local levels that are neither government nor business that are engaged in development and poverty reduction work at local, national and global levels around the world. The definition of technology as adopted in this research is the means of applying understanding of the natural world to the solution of practical problems and technology transfer as referred in this research is the "intervention" by Non governmental organisation with the aim of accelerating the flow of technologies to local communities. The underpinning point of this definition is flow of know-how from nongovernmental organisation to local communities. Community capacity consists of human, physical, financial and social resources available to a given community that can be mobilised to meet local needs (Kelly and Caputo, 2006). Hence, Smillie's (2001), definition of capacity building which states that capacity building is a

process through which people of a given society are motivated to transform their physical, socio-economic, cultural, political, and spiritual environments for their own well being and the advancement of their society suits this paper.

This paper will limit the scope of the study by exploring NGO activities in marginalised communities in Nigeria. As NGOs activities are numerous, and they are involved in numerous projects and programs, this paper is concerned only with NGOs in housing projects especially in marginalised communities in Nigeria. Therefore, the paper will only focus on community based projects that deal with the construction of houses.

This paper examines NGOs efforts in development through capacity building. It does this through firstly looking at the concept of Non-governmental organization and capacity building through appropriate technology transfer as this forms the underpinning foundation in understanding their involvement through community based activities.

2 Literature Review

The literature review looks at the NGO phenomenon and examines NGOs literature in order to comprehend and have a general insight and understanding of the NGOs phenomenon in Nigeria. This section will review existing literature on NGO community development and capacity building through appropriate technology transfer. This is important because it sets a precedent enabling the appreciation of the research objective.

2.1 The concept of NGOs

It is essential to explore the concept of non-governmental organisations (NGOs). It is also crucial to examine what NGOs do and this can be understood from the exploration of their definition and features. Although varied by different authors, conceptual explorations have leaned to description rather than the definition. The term NGO has been attributed to include independent sector, private voluntary organisations and non-state actors (Lewis, 2001). Authors have taken care to point to the fact that NGOs activities are diverse and heterogeneous. This is one of the reasons why authors have taken care not to generalise the definition to fit all the different organisations that make up this organisation into one box (Atack, 1999, Edwards and Fowler, 2002, Lewis, 2001). This is because some NGOs can be large and some can be small. Others can be formal or informal, externally funded or driven by volunteers, charitable or radical or empowerment based (Lewis, 2001). Some authors describe NGOs as private and non governmental (Lewis, 2001). Others purport that the definition stems from the characteristic of NGO is that they are voluntary in nature and that this has a role to play in NGO legitimacy (Lewis, 2001).

Authors such as Lewis (2001 pg. 2), purports NGOs to be an embodiment of large bureaucratic organisation with multi- million dollar budgets as well as small, informal local initiatives. Some are engaged in long-term community development work others provide short-term emergency relief. NGOs could be large or small, informal or formal,

externally funded or driven by volunteers, charitable, and paternalistic or radical and empowerment-based.

According to Fowler (2002), NGOs are third party, serving non-profit based, legally constituted non-state organisations, directly or indirectly reliant on the system of international aid. As Edwards and Hulme (1992) puts it, the term NGOs encompasses an enormous diversity of institutions. For the purpose of this research, the acronym NGOs refers to Non Governmental Organisation and DNGO refers to Development Non Governmental Organisation and will be defined as independent, non profit, developmental, voluntary organisation involved in long term development programmes operating at international and local levels that are neither government nor business.

NGOs are based in most countries and have terminologies for each type. Northern NGOs (NNGOs) are NGOs based in a developed country that operate internationally, International NGOs (INGOs) or are NGOs based in three or more countries; Southern NGOs are NGOs in the third world countries or developing countries, and many other kinds of non-profit organizations throughout the world. NGOs are engaged in development activities aimed at enhancing livelihood and reducing poverty through capacity building and other poverty alleviation activities in disadvantaged areas not only in Nigeria but also in other developing countries (Werker and Ahmed, 2008). While NGOs have been said to play important roles in development such as implementers, catalysts and partners (Lewis, 2001), non governmental organisations are said to continually strengthen and empower civil society at organisational level, sectoral level and societal level (Lewis, 2001, Mitlin, 1998). There have been debates as to what is meant by strengthening or empowering civil society. Lewis (2001) points out that it is embedded in NGO service delivery role. This point is confirmed by Korten (1987) in his description of NGOs generation. Two important terms emanate from NGO services delivery; empowerment and participation. Here, NGOs Participation is used as a tool to get the people involved in activities that concerns them (Lewis, 2001). Therefore, NGOs are said to empower civil society through developing skills, capacity and the transfer of knowledge or technology so as the community will be sustainable when the time scale of the projects is finished (Lewis, 2001, Mitlin, 1998).

2.2 NGOs and capacity building

The concept of capacity building was associated with achieving economic stability and growth in developing countries emphasising not only on institutional building but also technology development and transfer (Harrow, 2001). Capacity building is said to strengthen communities as well as to address “social exclusion” (Diamond, 2004). In capacity building, elements such as community capacity are important. Community capacity consists of human, physical, financial and social resources available to a given community than can be mobilised to meet local needs. To foster community development, a community has to have the capacity to mobilise the resources required for them to identify and respond to their own needs. The purpose of community capacity building is to foster conditions that strengthens the characteristics of communities which in future enables them to be self reliant (Kelly and Caputo, 2006).

2.3 Capacity building in community development

community development is popular and to some extent successful with NGO donors and development agencies because it encapsulated self help (Lewis, 2001). An important element proceeding from community development is the aspect of community participation and community capacity building (Kelly and Caputo, 2006, Mequanent, 1998). Community development became a better strategy because of its process of interaction and inclusion of marginalized communities as well as its underpinning vision of self help and community self-reliance (Powell and Geoghegan, 2006). NGOs became the primary focus for localised intervention in development projects because of some success in poor communities (Devine, 2006, Lewis, 2001).

Accordingly, in order for community development to be successful, the communities have to have the given capacity to manage, and implement development projects (Kelly and Caputo, 2006). One important strategy employed in community development by NGOs is capacity building, which has elements of participatory methods and inclusion in decision-making (Craig, 2007, Eade, 1997, Kelly and Caputo, 2006, Sheng, 1989). According to Cairns et al (2005), capacity building can be viewed as development work that strengthens the ability of people to build their knowledge and skills so that they are better able to achieve their goals, manage their projects and take part in partnerships.

However, in order to build capacity, the community have to be important players in their projects by participating in development projects. Community participation is the involvement of the community in the planning and decision making of development projects. Participation ensures that the communities have an influence on the direction and execution of development projects with a view to enhancing self-reliance (Craig, 2007, Sheng, 1989). On the other hand, international organisations such as the World Bank have argued that capacity building should be accompanied with appropriate transfer of technology (UNEP, 2000). According to the report, technical support is effective at the initial stage of capacity building. Technology transfer has been defined as the transfer of technology from one organisation to another organisation, from one country to another country, from person to person or from university to organisation (Mohammed, 2000). While others such as Udo and Edoho (2000) assert that technology transfer involves the acquisition and utilisation of technology by a country, organisation, person other than that in which the knowledge originated.

In Nigeria, there have been changes in policies, especially after independence, in that direct service provisioning declined (Marcussen, 1996). During the 1980s and 1990s, with the adoption of structural adjustment policies by many African countries, including Nigeria, there was a decline in provision of services by the government (Lewis, 2001). These policies will see the Nigerian state reduce the roles they play in economic, social and political development. The policies created a gap in the provision of services normally provided by the government to communities (Powell and Geoghegan, 2006). These policies helped create a group of marginalised communities who were deprived of basic commodities due to the effects of the policies (Fisher, 1997). In some communities, basic necessities such as housing became an important issue. Inadequate housing became a major problem facing the Nigeria government and communities. Followed by the fact that housing conditions continued to worsen due to urban population (Ogu and Ogbuozobe, 2001). This is basically due to the fact that people

from rural communities continue to migrate to the cities for better quality of life. This shift in policy brought about an increase in numbers and function of NGOs (Fisher, 1997, Ngeri-Nwagha, 2002). Many NGOs, among other activities, became engaged in building affordable housing in the country (Agbola, 1994). NGOs as mechanisms of technology transfer acquire their technologies from a range of sources. This can be through government, as Farrington (1990) purports, through funding bodies or through individuals. Consequently, NGOs introduced some new technologies for building affordable housing into the country. NGOs became an important component in the housing sector (Tipple, 1994) and began to focus on grass-root communities, as they were considered to be important and capable of transforming the state and society (Fisher, 1997).

However, apart from being labelled the 'magic bullet' (Edwards and Fowler, 2002) for development problems, NGOs have their shortcomings. The orthodox paradigm that NGOs are an alternative to development and participatory in nature, has also been contested and called into question over the years (Lewis, 2001, Mitlin et al., 2007). NGOs appear to have the same problems of bureaucracy as the state and are criticized for not reaching the poorest people as they have been claimed (Edwards and Hulme, 1996). There are criticisms that NGOs are no more cost effective than the government sector or other sectors (Edwards and Hulme, 1996). NGOs are accused of co-optation of confirming with donors goals, ideology and values (Kowalewski, 2004).

3 Research problem and justification

One of the most significant discussions in relevant development literature is the notion of self-reliance and local participation in development projects (Bebbington, 1993a, Bebbington et al., 2007, Kleemeier, 2000, Michener, 1998). Hence a body of literature has been written that states that for communities to be self reliant, they have to participate in development projects (Chambers, 1994, Craig, 2007). And in order for communities to participate, they must have the capacity to do so (Kelly and Caputo, 2006). Other scholars have identified that in order to be self-reliant, the communities and NGOs have to have a shared focus and aligned interest (Bebbington, 2005, Bebbington et al., 2007, Catley and Leyland, 2001, Cohen and Uphoff, 1980). Bebbington (1993a) further emphasised on the importance of taking into consideration the cultures of communities in technology transfer and capacity building in order for the projects to be sustained. The major problem is that despite all these inputs, the mechanisms in place at present have not made it possible for many communities to operate without external help. Previous research to date has tended to focus on NGOs as organisations and strategies of community development. However, far too little attention has been paid to how such strategies and organisation could fit with the communities. Therefore, the research proposes that in order for the communities to be self reliant through capacity building, all mechanisms, such as, aligned interest and shared goals, participatory processes, cultural considerations and resources have to work together and not in isolation. Prior research on this topic predominately concentrated on the different activities of NGOs (Atack, 1999, Edwards, 1999, Fisher, 1997). Or how NGOs are a basic form of popular participation (Bebbington, 1993b). Others focused on NGO expertise and their ability to contribute to the development process (Bebbington and Riddell, 1995, Charnovitz, 1997, Craig, 2007, Devine, 2006, Domeisen, 2006,

Fisher, 1997, Weiss and Gordenker, 1996). Farrington and Biggs (1990) examined the NGO technology transfer in the agricultural sector. (Bebbington, 1993b) examined approaches to agricultural technology development while (Bebbington and Thiele, 1993) looked at how NGOs are involved in technology transfer. Therefore, it is pertinent to focus on the interaction that enables successful outcomes of the interaction between NGOs and marginalised communities. Hence, rather than concentrating wholly on the NGO strategies or well designed development project as Kwaja (2006) asserted, the fusion of the above concepts will be used as a conceptual framework as shown below.

4 Conceptual Framework and discussion

Sustained self-help has been a central component mentioned in NGO literature as mentioned in the above section. This can be achieved when the communities are active participants of the development projects. By participation, it is purported that the identification of community need is recognized. This also empowers the communities to be self-reliant and reduce dependence on external help. By participating, the communities are empowered with tools to assist them to be self-reliant. The conceptual framework examines the interaction of NGOs and the communities whilst paying particular attention to capacity building through community housing projects.

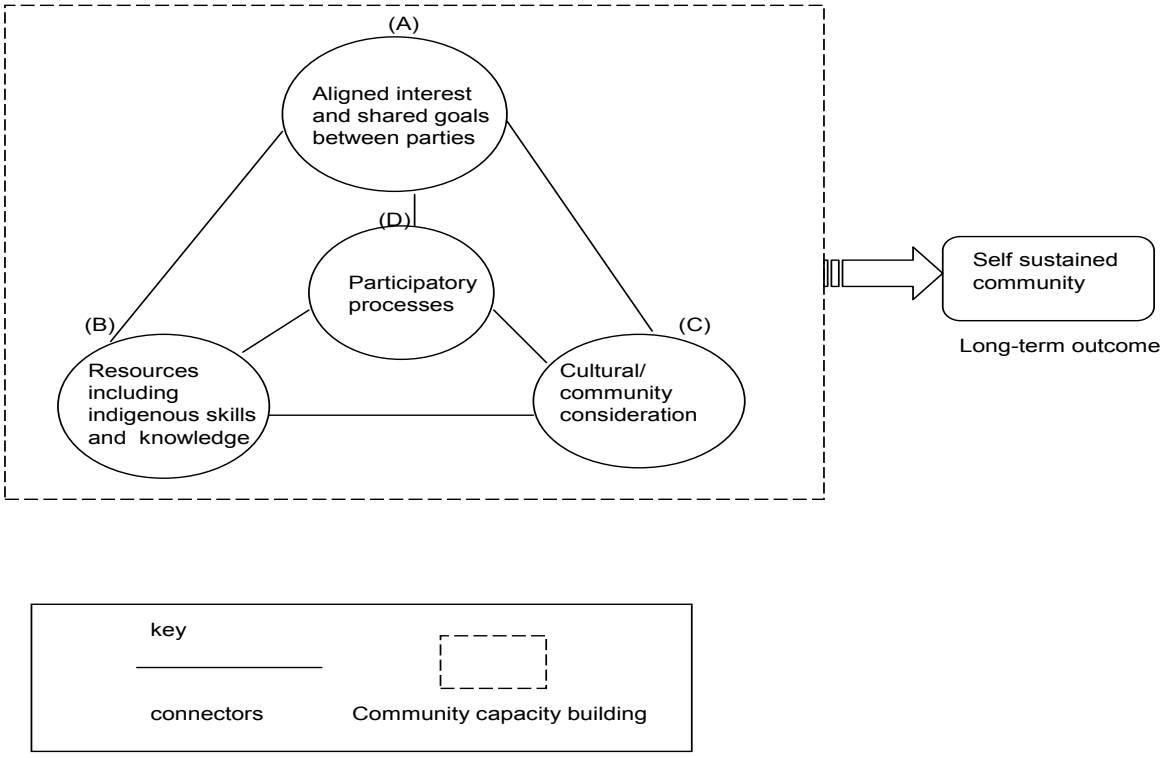

Figure 2: conceptual framework

Figure 2 illustrates the conceptual framework for this research. The framework shows the mechanisms in place and how they need to work together to achieve a self reliant community. The three links (A) (B) and (C) reinforces the research problem. The above

framework illustrates that for a self reliant community, all three must function together and (D) is required to make this possible. The uniqueness of this framework is that links are reinforced and considered as a whole rather than in isolation.

5 Methodology

The proposed methodology to be used to gain in-depth understanding of the phenomenon consists of an exploratory case study, employing embedded data consisting of NGO activities and community capacity building in community housing projects. Although there are several research strategies available in research, each with their advantages and disadvantages and none being more appropriate than the other for research purposes (Benbasat et al., 1987), an in-depth qualitative case study examining this phenomenon has been adopted because this will help promote more understanding of the research problem and is appropriate to satisfy the research aim and objectives. The Justification for adopting the case study strategy lies in the principle purported by some research scholars such as Benbasat et al (1987) Bryman, (2008), Creswell, (2007), Eisenhardt, (2002), Yin, (2003), that the nature of the research topic and questions should influence the actual selection of a strategy. Therefore, as the study is focused on contemporary events, and the research aim deals with the interaction between two participants making behavioural control impossible, and is not about describing the incidence or prevalence of a phenomenon as in surveys, or about tracing links over time as in history strategy, or to describe a culture-sharing group as in ethnography the researcher adopts the case study strategy as the most appropriate for the research.

Embedded multiple case studies is adopted for this research. The research will investigate two communities and NGOs in Nigeria. The reason for choosing a case study in Nigeria is because; Nigeria fits the boundary being investigated and the researcher is Nigerian and passionate about community development in the country. Nigeria is a developing country where inappropriate housing has been a major problem for marginalized communities who still lack adequate housing. NGOs have carried out various housing projects in the many regions in the country. Communities where purposively selected to fit in with the research aim. One community is located in the north and the other in the south of Nigeria. The two communities were purposefully selected so they do not represent major communities but marginalized communities in Nigeria. The two communities are small communities in rural areas of the country. They differ in culture, language and beliefs. The participants of the two communities were selected with the help of key knowledgeable community leaders who have first hand information on the subject area. From the community side, these representatives will mostly be heads of community-based organisations or heads of the communities. The NGOs selected will be those involved in the construction of housing and are committed towards capacity building and improving the lives of the communities. The main aim of choosing these cases is for literal replication as Yin propounded.

The finished output of this paper would make a contribution to knowledge by illustrating how the present mechanisms hinder the interaction between NGOs and communities in absorbing and utilizing building technologies.

6 Conclusion and the way forward

This paper explored relevant literature on the roles, responsibilities and scope of non governmental organisation. Previous studies have illustrated NGOs as important players in development especially in developing countries (Edwards and Fowler, 2002, Fisher, 1997, Mitlin et al., 2007). Community development, Capacity building, and technology transfer, are all concepts used to describe NGO activities in literature (Lewis, 2001, Ukpong, 1993, Werker and Ahmed, 2008) and have been reviewed in this paper. One of the more significant findings to emerge from this study is the recognition that community capacity building sets a stage for community development and does translate to community self-reliance. The paper concludes that a number of problems need to be addressed before such activities can be satisfactorily intertwined into successful community capacity building. An implication of this is the need to further investigate the nature of effective interaction between NGOs and marginalised communities and its impact on the outcomes of housing projects in marginalised communities. This paper will serve as a base for future studies and further work needs to be done to establish the outcomes of capacity building in development housing projects. Therefore, the next step is to collect data that will help in answering the research problem.

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Organisation E-Readiness: People and Process – Success of Collaborative Environments in Project Management

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Abstract
Collaborative environments for construction project management are widely accepted as becoming an essential element to address construction business improvement. However, there are still many failures in adopting it. Various cases studies has shown people and process in organisations as critical success factors; not technology. Organisations can address this issue further through the ability to measure electronic readiness (e-readiness) of their organisation, enabling them to adopt and use the available ICT to improve their business strategies and performance, and services to customers. E-readiness reflects organisational soft issues such as business processes, management structure, change management, people and culture.

Keywords:
Collaborative Environments, Construction IT, Critical Success Factors, Extranets, E-Tendering, People, Process

1 IT-based performance in construction

The UK government, industry and clients are all seeking to bring about change in the construction industry to improve quality, competitiveness and profitability and to increase value to clients Alshawi and Ingirige (2003). Over the past decade, the implementation was carried out through initiatives such as the Construction Task Force, the Government Construction Clients Panel (GCCP), the Construction Clients Forum (CCF) and Constructing Excellence (CE). These initiatives have also contributed to the Egan report's recommendations (Egan, 1998) in securing a culture of co-operation, teamwork, and continuous improvement in the performance of the industry.

In a recent study by a European task force on ICT sector competitiveness and ICT uptake highlighted the importance of ICT based innovation in bringing productivity improvements and competitive advantage to industry. It showed that since the mid nineties there is a constant decline in labour productivity which is mainly attributed to the lack of ICT related investment. Evidence shows that higher productivity growth

rates observed in the US and other world trade partners of Europe are resulting from greater use/integration of ICTs by all segments of the economy. For example, productivity growth in the US has been mostly driven by ICT-using services sector. (European Commission, 2006) However, industries have not been in a position to capitalise on the investment in terms of productivity growth (OECD, 2003).

In Construction, it is widely accepted that ICT is becoming an important element of any organisational infrastructure, particularly to address construction business improvement. For small businesses, standalone applications such as e-mail, presentations and report writing are seen to be essential components for running any business. For larger organisations, the picture is more complex where ICT infrastructure plays a key role in supporting core business functions. However, there is ample evidence that ICT have failed to bring about a competitive advantage to organisations in spite of the large investments over the past decade. A large percentage of systems have failed to achieve their intended business objectives. In a recent study which was carried at the University of Salford in the in the area of "IT failure" have shown that 75% of IT investments did not meet their performance objectives (Salah, 2003). Such projects were abandoned, significantly redirected, or even worse, they were "kept alive" in spite of their failure. The cost of funding such projects and the missed opportunities of not benefiting from their intended capabilities constituted a tremendous loss for organisations. This dissolution in the strategic benefits of ICT is currently forcing many construction organisations not to invest in IT for any competitive advantage but for the reasons of bringing efficiency and effectiveness to business processes.

This fact can severely hinder the UK construction industry to use ICT in gaining productivity improvement and sustainable competitive advantage which is critical to maintaining its position nationally and internationally. This is particularly true in the light of the continuous challenges that the industry is facing such:

(a) Globalisation of the marketplace due to productivity improvements and advantages in economies of scale, some foreign firms are capable of competing with local firms on price, quality and delivery.
(b) The economical forces which affect the client organisations.
(c) Increases in project complexity which is reflected by the large number of specialists who have to communicate with one another for efficient project execution.
(d) The need to achieve faster results with the given resources, hence placing severe time pressures on the entire project team.
(e) New procurement practices such as Private Finance Initiative (PFI) and partnering have started to influence business strategies of organisations.
(f) Client sophistication which is becoming a major driver for productivity improvements in construction.

2 Collaborative Environments (Extranets)

Collaborative environments present an environment whereby various construction professionals could come together and meet in a similar environment. These environments present a standard platform for various project partners to communicate, exchange data and information, data storage and replication, archiving and much more.

Most of all, it initiates a drive for IT integration through data and information interchange and reuse.

The massive growth in collaborative environment concepts brought the scenario of individual and islands of development, partly caused by the fragmented nature of the UK CI. Many collaborative environment vendors were introduced into the industry, among large vendors are such as BIW Technologies (http://www.biwtech.com), 4Projects (http://www.4projects.com/) and BuildOnline (http://www.buildonline.com/). Other vendors include Cadweb (http://www.cadweb.co.uk/), ProjectVillage (http://www.projectvillage.com/), Integration (http://www.integration.arup.com/), Viecon (http://www.viecon.com/) and many more. Fragmentation of the industry also brought smaller providers servicing the niche markets in the CI.

The main driver of collaborative environments is to gain competitive advantage – through improved work processes; more efficient information sharing and reuse; better returns on investment; create strategic partnerships and "win-win" culture; availability of project information management strategy; improving buildability and whole life costs with the supply chain; public and private initiatives. (Alshawi and Ingirge, 2003; Jackson, 2004; Pavlov and Aleksandrova, 2003). Harnessing IT in the organisation will provide the competitive advantage over competitors, which is a crucial goal and vital task for many organisations today (Hedelin and Allwood, 2002). Having the edge equates to a longer and a more extensive cliental, not only in the UK but around the world. Computing usage incorporates better efficiency, speed, accuracy and effectiveness in everyday business processes and management – data is collected and used as information, collective information are analysed as intelligence for the organisation (Amit and Zott, 2001; Sulankivi, 2004). Collaborative environments also present the ability to share and reuse information in the industry overcomes various problems in accuracy, reliability and cost. The establishments of standard data exchange, such as the XML (eXtensible Markup Language) and IFC (Industry Foundation Classes), help provide the common interface for file and data sharing and reuse, publish, download and upload, and other exchange processes (Alshawi and Ingirge, 2003). The CI community always demands better returns on investment. Project information strategy seeks to generate an agreement on how a single project will produce, exchange and manage its information so other participants in the project could benefit from improved sharing and reuse of information (Neef, 2001). Dramatic improvements in IT cost, infrastructure and performance are leading the changes in organisational strategy, structure, process, distribution channels and work. The management will how have better ROIs in IT in the organisation than ever before. With the increase in project size, there are more resources, thus, larger investment could be invested in more sophisticated computing systems and approaches. This could be justified with improved productivity and performance over the life of the project.

Perhaps the largest barrier to collaborative environment adoption is the construction community (people), not the technology – lack of awareness; no quantifiable measurements or indicators of success; limited skilled workers; transparency in the CI; poor cross-disciplinary communication; fragmented supply chain; poor industry standards for information interchange (Alshawi and Ingirge, 2003; Martin, 2003). Again, CI finds it difficult to accept change or a new work environment or even

cooperate with other organisations in the industry. Overwhelmed in their traditional mindset, industry players are reluctant to adopt or consider changes to everyday processes, therefore, pay less attention to the advantages and benefits of IT (Sun and Aouad, 2000). To date, there are no recognised quantifiable methods to measure and quantify the benefits of IT systems in organisations, reflecting the perception of IT of being 'complicated' is causing the necessary risk. Transparency of work processes in the CI remains questionable; project information is not being shared, resulting in waste of knowledge, resource and intelligence (Jackson, 2004; Sulankivi, 2004). Poor communication has also often been identified as a bottleneck for performance improvement and it also re-enforces the confrontational and blaming culture. Poor data and information exchange standards from different developing standards prevents computer systems from 'talking' to each other and the exchange of information and data is virtually impossible (Mould and Starr, 2000). This issue is being widely discussed across all industries, the CI included.

3 Managing Project over the Web

Web based developments have created an impact on project collaboration in industry. According to the Computer Weekly (2007), project collaboration has been well received in the construction industry, as it has long suffered from complex supply chains involving architects, builders, designers and engineers. Therefore, a lot of web-based service providers in the construction industry have focused their attention on developing this area of competence.

Alshawi and Ingirige (2003) addressed the area of web-based development, noting that communication plays a vital role in solving problems in project management. Scanlin (1998) also pointed out that communication consumes about 75% to 90% of a project manager's time, therefore, information needs to be current, and available 'on demand'. Biggs (1997) also lists communication as the root cause of most project failures, but highlighted that the latest web-based solutions can link with email, or collaborative software which can reduce the incidence of people-related issues. Deng *et al.* (2001) point out that the extensive physical distance between project participants extended over national boundaries is the main cause which can lead to delays in decision-making. Wide communication problems, ranging from delays, through to distortion of the message, can result in cost and time overruns in projects. Furthermore, the dismissive nature of expenditure on making long distance telephone calls, facsimile transmissions etc, have made the project management community in construction look for more viable alternatives.

Although there are limited contacts between the top executives, it is the knowledge workers who collaborate more regularly on day-to-day running of the project. Most of the collaborative IT tools, such as email and web-based tools etc. are widely being used by the knowledge workers (middle level managers). As a result of this emphasis on communication, new technologies have been developed for networking, information sharing, database management systems, etc. However, in contrast to the manufacturing and retail industries (where most of the new developments have taken place), the overall construction industry has shown a relatively slow up-take of web-based technologies to improve its practices (Building, 2001). This situation is changing however, as more and

more firms in the construction industry are starting to realise the benefits of improving communications between project participants - which can lead to improved cost efficiency, better quality and improved competitive advantage.

It is expected that the Internet will be used to leverage even greater potential to project managers over the next five years. The Internet is increasingly providing a conduit for rapid information transfer, so messages not only can reach the recipients more speedily and accurately, but are also traceable to the sender (which is increasingly being used for contractual reasons). This ease of transmission can also save money for construction companies, especially when having to communicate with overseas construction entities, as the cost of providing and maintaining Internet provision is often much less than couriering documents or continual international direct dial (IDD) telephone usage. Internet provision also provides other benefits, especially when high data volumes are expected, as it does not have restrictions on locations, time or different computer operating systems.

The rapid evolution of communications technologies is making distributed projects increasingly more viable (Ly, 1997). Project participants are often widely dispersed, yet they can be coordinated by sophisticated tools. The increasing availability and the usage of the Internet by small to very large-scale construction organisations have enabled project management to be performed over the web.

4 Critical Success Factors: Process and People

Construction organisations and professionals are aware of the benefits and advantages of collaborative environments through many high-profile success stories (4projects, 2008; BIW Technologies, 2008). However, when new software or new processes are introduced in any organisation, it is only natural for the employees to be cautious and afraid of their jobs; employees will fear responsibility and process changes (Lou, 2006).

The main attributes of the high percentage of systems failure are rarely purely technical in origin. They are more related to the organisational ‘soft issues’, which underpin the capability of the organisation to successfully absorb IS/IT into its work practices, in this context, collaborative environments. IT is still, in many cases, being considered by the management of organisations as a cost cutting tool (owned and managed by their IT departments). This ‘Technology push’ alone, even though to some extent is still dominating in many industries like construction and engineering, will not harness the full business potential of IS/IT and thus unable to lead to competitive advantage. Although the implementation of a few advanced IT applications might bring about ‘first comer’ advantage to an organisation, this will not last long as it can be easily copied by competitors. It is the innovation in process improvement and management, along with IT as an enabler, which is the only mechanism to ensure sustainable competitive advantage. This requires an organisation to be in a state of readiness which will give it the capability to positively absorb IS/IT enabled innovation and business improvement into its work practices.

People are the determinant force, deciding the success or failure in the uptake of e-tendering and collaborative environments. When the individual is willing to change,

there will be the willingness and aspiration to try new things, explore new horizons. With top management support, presence of a *champion* among employees and a motivated manager, this will drive the desire to try and change from the old ways. (Neef, 2001; Retik and Langford, 2001). Employee behaviour towards collaborative environments and e-tendering could also be reflected into the Maslow's hierarchy of needs – the individual process; the interpersonal process; the organisational structure and dynamics.

Organisations must be process-led and not technology-led – organisations must not implement new technology into current processes but allow technology to be absorbed into the current organisational processes. Radical process changes may break existing organisational processes, crippling the organisation. Introducing new technology will incur changes. Employees may have to change the way they work to suit technology, inciting work inefficiency, disorganisation, low morale, no motivation, and some may be fear for their job security (Beise, 2004; Deng *et al.*, 2001; Lou, 2006).

In an attempt to find the impact of the business processes and people issues on the successful uptake of collaborative environments, a number of case studies of construction projects were undertaken with a building contractor, project management consultants and engineering consultants. All cases are based in the UK, using collaborative environment software as the case study. The analyses of the cases show that collaborative environment solution is welcomed by most employees in the selected organisations. Employees welcome the changes as it improve productivity, ensure work efficiency and less repeating work through data and information reuse. This enables organisations to handle more jobs in a single timeframe with this new system.

4.1 Process

The finding of this study reveals the potential critical success factors for the business process issues in the implementation of e-tendering in collaborative environments:

Potential Critical Success Factors for the Process Issue
• Changes must be process-led, not technology-led. • Alignment of collaborative environments implementation strategy to project team strategy; • Never change the entire work process to suite technology or software solutions; • Conduct self-evaluations before change; • Conduct change through change strategies – Business Process Reengineering, Change Management, etc.; • Alert to current research and development methods for better business processes.

4.2 People

On the people issue, the following potential success factors were found critical in the implementation of e-tendering in collaborative environments:

Potential Critical Success Factors for the People Issue
• Motivation of employees; • Interest in IT of employees; • Work satisfaction of employees; • Prior experience with collaborative environments ; • Employee attitude towards collaborative environments ; • Presence of a "*champion*"; • Level of top management support; • Security of job – technology does not replace human processes; • Internet access and type of availability; • Adequacy of training; • Adequacy of resources; • Employment of the younger generation – more interest, training and focus on IT; • Proven computing technology and capabilities of the collaborative environment solution; • Proven to improved efficiency and productivity in work of the collaborative environment solution.

5 E-readiness

It is important to implement the right ICT solutions for the right processes, to the right degree with right timing. Individuals and the organisation must be prepared and be ready to changes to come. Striking the right balance is a goal which all organisations and countries are striving to achieve. Therefore, national leaders and industry chiefs need to continuously assess the position of their organisations. Every country is different; every organisation is different; and every country of the organisation operates in is also different. It is believed that successful e-business and e-commerce can take place if, and only if, emergent initiatives are built on robust foundations of readiness (Alshawi, 2007; Waseda University, 2007; UN, 2008). The notion of e-readiness means different things to different people, in different contexts, and for different purposes. As a result, a large gap exists between ideas and concepts on one hand, and practical applications and implications, on the other (bridges.org, 2005; Economist Intelligence Unit, 2007; UN, 2008). Gaps also exist between new expectations and capabilities in place (World Economic Forum, 2007).

Much of today's e-readiness initiatives are driven through the private sector. However, various consulting and research councils have set initiatives to promote e-readiness in the national and organisational levels; each contributing towards the realisation and empowerment of e-readiness for nations and organisations. Among the leaders in this initiation are the United Nations, World Bank, Economist Intelligence Unit, World Economic Forum and Asian Pacific Economic Cooperation (APEC).

E-readiness as a global agenda is not a new proposition; however, e-readiness as an organisational agenda is still in its infancy. Achieving e-readiness for built environment organisations, by its nature, will be a very challenging task. The industry is well known for being traditional and fragmented, not easily moved by technology and change. As the world becomes more dependent on e-commerce and reliance on electronic transactions, the industry do not have a choice but to change and move forward. However, this change must come at a gradual pace.

6 Summary

Although the implementation of a few advanced IT applications might bring about "first comer" advantage to an organisation, this will not last long as it can be easily copied by competitors. It is the innovation in process improvement and management, along with IT as an enabler, which is the only mechanism to ensure sustainable competitive advantage. This requires an organisation to be in a state of readiness which will give it the capability to positively absorb IS/IT enabled innovation and business improvement into its work practices.

The term "e-readiness" is coined to measure how "ready" are organisations to adopt and use the available IT to improve their business performance and services to customers. It reflects the organisational soft issues such as business processes, management structure, change management, people and culture. The importance of organisational e-readiness to successfully embrace IT into work practices is gathering pace both in academia and industry due to the large investments in IS/IT over the past decade of which a large percentage didn't meet their intended business objectives.

Organisations need to rethink their processes, structure and work environment in the light of the advances in IT in order to harness the value of technology in achieving sustainable competitive advantage. The need for "forward looking" management tools to measure the current capabilities of organisations in the relevant areas and to predict the required level of organisational change becomes critical. This is an area which is highly under-researched and needs focused efforts to develop tools, guidelines and methodologies in order to help organisations to effectively transform their work environment into dynamic ones where IT-based innovations underpin business improvement and sustainable competitive advantage. Understanding e-readiness can enable organisations to enter new markets – aware of both the revenue potential and the possible bottlenecks to growth. Future research shall take on a measured approach to help the organisations to be e-ready – a practical framework to measure the readiness levels of organisations.

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Burnout and the commitment profile of architecture students

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Abstract:
This paper examines commitment profiles of Hong Kong Chinese architecture students, and the correlation between burnout and the healthiness of students' commitment profiles. 294 students enrolled in the Bachelor and Master programs of architecture in two universities in Hong Kong participated in the study. The Chinese version of the Maslach Burnout Inventory-Student Survey and revised version of Occupational Commitment Questionnaire are administered to measure burnout and commitment profile. Multiple-regressions are conducted to test the hypothesis. The findings support the idea that burnout does not necessarily result in turnover. As affective commitment and normative commitments decrease with burnout, continuance commitment increases to retain the burned-out students in the program. However, burnout de-healthilizes the commitment profile of students, shifting students' focus of learning from the task to the cost. The study suggests a need to prevent burnout and build up healthy commitment profile among architecture students.

Keywords:
Architecture student, burnout, commitment profile

1 Introduction

Burnout reflects a relationship of hostility and alienation between the person and his/her job, the opposite of which is engagement, a relationship of reconciliation and acceptance (Schaufeli *et al.*, 2002b). The three symptoms of burnout—exhaustion, cynicism and inefficacy—are developed from different aspects of work environment and contribute differently to organizational outcomes. For architecture students, burnout

is especially damaging, in that it may shift motives of study, paralyze creativity, and develops unhealthy copying styles for future professional's burnout.

Students' motives of study can be understood through the three-dimensional construct of commitment. Commitment is people's psychological attachment to and identification with their profession, organization or study program. People choose to stay for three kinds of motives: they want to (affective commitment), they have to (continuance commitment), or they think they ought to (normative commitment) (Meyer 1993). Commitment functions as retaining personnel in an organization or profession. But different motives in the commitment profile will result in different outcomes. Affective commitment (AC) is found to be positively related with job performance, while continuance commitment (CC) is found to be negatively related with the outcome variables. That is, more AC and less CC in individual's commitment profile are associated with better outcome (Iverson and Buttigieg, 1999).

From the management perspective, students are both the clients and the frontline workers in the university context (Handy, 1984; 1989). They won't get the best service unless they perform an excellent work. The architecture curricular are centered on design studio, where students learn to think and act architecturally, to synthesis what they learned form other courses in design project and improve through critics from teachers and other people (Ledwitz, 1985). In design studio, students receive a design task at the beginning of a semester. Through a process of understanding and accomplishing the tasks and interacting with faculties in desk crits, juries and public reviews, they develop analytic and synthetic thinking, sensitivity and creativity which are necessary competencies for future architects (Schön, 1984b; 1984a; Anthony, 1991; Kvan, 2001; Koch *et al.*, 2002).

Precedent studies reported that burnout is associated with diminishing affective commitment (e.g Leiter and Maslach, 1988). But few have investigated the relationship between burnout and the full profile of commitment. As part of a large project on architecture students' burnout, this study investigates burnout's consequence on individual's commitment profile among Hong Kong Chinese architecture students.

2 Literature review

2.1 Students' burnout

Burnout is defined as a crisis in people's relationship with their job (Maslach *et al.*, 1996). A burned-out person is locked in a destructive mode of interaction with his/her work. He/She perceives, interprets and reacts to the work with hostility and alienation. The broken relationship is manifested in three syndromes: exhaustion (EX), feeling of stressed-out by the work; cynicism (CY), feeling of meaningless of the work; and inefficacy (IE), feeling of low capacity for the work (Schaufeli and Taris, 2005).

The three dimensions are indispensable but distinctive factors to constitute burnout. They are related with different individual and organizational precursors and outcomes (Maslach, 2003). For example, Leiter (1991) in a study of 177 hospital workers reports that EX is developed from work overload and interpersonal conflict, CY is developed from lack of social support, while IE is resulted form lack of social support and

underutilization of skills. Maslach, Schaufeli and Leiter (2001) reported that EX is related with workload, IE with reward, and CY with unfairness in worklife. In an Australia-Hong Kong comparative study of burnout experience among construction students, Lingard et al (2007) report that EX is related with university-to-work conflict in the Australian sample, with amount of study time and number of conflicting demands within studies in the Hong Kong sample. CY is found to be significantly correlated with peer support and conflicting study demands in the Hong Kong sample. IE is found to be related with both work-to-university and university-to-work conflicts in the Australian sample, and with family support in the Hong Kong sample.

2.2 Students' commitment to architecture

Commitment a psychological tie between a person and his/her job (Meyer *et al.*, 1993: 539). The target of commitment can be the team, organization, occupation, or study program. Commitment explains how people would like to stay and why they stay. A widely accepted definition of organizational commitment is "the relative strength of an individual's identification with and involvement in a particular organization" (Mowday, 1982: 27), which focuses on the "how". An in-depth examination of the "why" reveals three facets within the motives of commitment: people stay because a sense of devotion (affective commitment, AC), because of the profit of staying and cost of leaving (continuance commitment, CC), because of a sense of obligation (normative commitment, NC) (Meyer and Allen, 1991; Meyer *et al.*, 1993).

The multidimensionality of the commitment construct provides an insight into the hidden motives that stimulate people's commitment to their job. With AC, the individual is committed to the task. With NC, the individual is committed to the working community. With CC, the individual is committed to the expected reward. All the three factors of commitment can retain people, but they are related differently with the quality of work (Scholl, 1981; Meyer *et al.*, 1993). Meyer et al (1989) in a study of 114 Canadian managers report that AC is positively, and CC negatively, related with supervisor-rated performance. Meyer et al (1993) reported that AC positively, CC negatively, and NC not, related with supervisor-rated performance in a sample of 603 nurses. Iverson and Buttingieg (1999) in their study of 505 Australian male fire-fighters found that AC is positively associated with acceptance of change; AC and NC are associated with lower turnover intentions and absenteeism; while CC is negatively related with personal flexibility. CC can paralyze creativity and diversity by weakening both organizational and individual learning (Iles and Robertson, 1990). Iles et al (1996) reported a significant improvement in employee's personal flexibility to organizational change by reducing CC whilst maintaining AC and NC in a management development workshop.

Contextualizng in the architectural school, students who are affectively committed (AC) to architecture are driven by curiosity and meaning discovery. AC functions as an anchor, focusing students on the design problem throughout the process of crits, juries and reviews, to ensure the 'right' competencies being developed. On the contrary, students who are continuously committed (CC) to architecture are driven by avoiding failure. The concerns of beneficial calculation drive students to look for the easy ways rather than tackle the real problem. 'Pseudo-competencies' are developed when they get through the studio process (Tay, 1998). Students who are normatively committed (NC)

to architecture are motivated by recognition from tutors and peers. Acquired through socialization, the norms of the design studios drive students to perform the 'right' self-image of a community member that one should fulfill.

2.3 Relationship between burnout and commitment

There seems to be little doubt that burnout predicts turnover intention (Koeske and Koes, 1989; Lingard, 2003). However, it is not clear how much of the intention will be committed to action. A buffer between burnout and turnover is commitment, which retains people in the absence of rewards (Becker, 1960; Scholl, 1981). Yet not all retentions are positive. The following description illustrates how a burned-out employee retained by concerns of costs changes his attitude of work:

"*Some people quit their jobs when they realize that they are burned out and have made the wrong career choice. Others stay, particularly those who cannot financially afford to quit and those who believe that quitting would waste their investment in their careers. …… He enjoyed time with his friends and family. But [the burnoutee] hated his work. He had only one goal left: to make it retirement, doing as little as possible without being fired.*" (Pines and Aronson, 1988: 22-24).

A few empirical studies explored the relationship between burnout and AC, but none has looked at burnout's impact on the full profile of commitment. Leiter and Maslach (1988) reported that burnout is negatively related with AC in a sample of 52 nurses. Leiter (1991) found in a sample of 177 mental hospital staff that EX can reduce AC. Neumann et al (1990) reported that student's identification with their college is reduced as a consequence of burnout (in terms of EX and IE) and the learning context.

Noting the gap that few study looked into burnout's consequence on individual's commitment profile, this study is proposed to investigate this relationship among Hong Kong Chinese architecture students. As reviewed in section 2.2, we can tentatively label AC and NC as healthy, and CC as unhealthy components in student's commitment profile. A commitment profile composing more AC and NC and less CC is considered to be 'healthier' than one composed of less AC and more CC. Based on these assumptions, this hypothesis is to be tested: the three dimensions of burnout are negatively associated with AC and NC, and positively associated with CC.

Methodology

3.1 Design of study

Studies pioneering the burnout research field were mainly conducted with methods of interviews and observations (Freudenberger, 1974; Maslach, 1976; Perlman and Hartman, 1982). This approach was later regarded as unsystematic and lacking objectivity (Schaufeli and Buunk, 2003). In 1981 the publication of a short and easy-administered psychometric measure, the Maslach Burnout Inventory (MBI) (Maslach and Jackson, 1981) enabled quantification of burnout. Quantitative methods facilitated with self-reported measures thereafter prevail over the burnout research field.

Unlike the development of burnout studies, commitment has been quantitatively measured ever since it was constructed in the organizational research field (Porter *et al.*,

1974; Buchanan, 1974). As commitment evolves from a single-dimensional construct (Becker, 1960; Mowday, 1982) to a multi-dimensional construct (McGee and Ford, 1987; Meyer and Allen, 1991), psychometric instruments develop as well to match the changing construct. The three-dimensional model developed by Meyer and Allen (1991) was further generalized from organizational commitment to occupational commitment (Meyer *et al.*, 1993), which has been the most widely used model of commitment (e.g. Powell and Meyer, 2004; Bentein *et al.*, 2005). The three-dimensional model of commitment is favored over the dominant single-dimensional model (Mowday, 1982; Mowday *et al.*, 1979) in that it offers more insights into the diverse motives of people.

Based on the above rationale, this study takes a quantitative approach. Data including students' burnout levels, commitment, and demographic information, were collected through self-administered questionnaires. Principal Component Analyses (PCA) were conducted to validate the measures of burnout and commitment. Multiple-regressions are performed to test the hypotheses.

3.2 Target population and procedure

As burnout is a culture-sensitive construct (Savicki, 2002; Lingard *et al.*, 2007), the target population is restricted to architecture students in Hong Kong in order to control the influence of social culture. There are two architectural schools in Hong Kong offering Bachelor and Master Programs. Questionnaires were administered among the 596 registered students in the two schools through online or paper-based survey.

Considering the diverse working habits of architecture students (Koch *et al.*, 2002), the survey was conducted in two steps. Paper-based questionnaires were first administered in the design studio to the majority of students, which was followed up with an online survey to reach those preferring working at home. Considering burnout is a sensitive topic, both surveys were anonymous to secure privacy of participants and obtain the most honest responses possible (Shimizutani *et al.*, 2008).

3.3 Measures

The questionnaire is composed of adapted versions of Occupational Commitment Questionnaire (Meyer *et al.*, 1993) and the Maslach Burnout Inventory-Student Survey (MBI-SS) (Schaufeli *et al.*, 2002a; 2002b), supplemented with demographic questions. Items were translated into Chinese and checked with back-translation by two bi-lingual experts.

3.3.1 Measure of students' burnout

Different measures used in precedent studies were evaluated for questionnaire design. The MBI (Maslach and Jackson, 1981) and its updated versions (Maslach *et al.*, 1996) are the most widely used instruments of burnout across cultures and occupations. Based on the MBI, Schaufeli et al (2002a; 2002b) developed the MBI-SS, which was validated among 1661 undergraduates from Spain, Portugal, and the Netherlands. Another widely used measure is the Burnout Measure (BM) (Pines and Aronson, 1988) and its condensed version, the BMS (Pines, 2005). However, the BM measures a single-dimensional construct, which indicates more of the EX dimension of burnout measured with MBI (Schaufeli and Enzmann, 1998; Corcoran, 1986; Schaufeli and Van Sierendonck, 1993). To obtain a complete picture of the burnout profile, the BM

measures were rejected for the current study. Students' burnout measure is adapted from items of the MBI-SS (Schaufeli *et al.*, 2002a). Each question is rated on a 7-point scale anchored by 0 (never) to 6 (everyday). PCA and reliability test of this sample (294 architecture students) yielded good validity and acceptable reliability (Cronbach's Alpha = 0.71).

3.4.2 Measure of student commitment

A most often used measure of commitment in precedent burnout studies is Mowday et al (1979) Organizational Commitment Questionnaire (e.g. Leiter and Maslach, 1988; Leiter, 1991). It is a well-tested and reliable instrument. However, it measures a single dimensional construct of commitment, which represents the AC dimension of the three-factor model(Meyer *et al.*, 1993; Meyer and Allen, 1991). As reviewed in 2.2 and 3.1, the single-dimension model is rejected and three-factor measure adapted in the current study to obtain a better understanding of facets of commitment.

For the above concerns, students' commitment is measured with the Occupational Commitment Questionnaire (OCQ) (Meyer *et al.*, 1993). The scale has been validated across occupations and cultures (Irving *et al.*, 1997; Cheng and Stockdale, 2003). PCA in the current data yielded a clear three-factor structure accounted for 65.03% of the total variance. The instrument showed good reliability (Cronbach's Alpha=0.77).

4 Findings and discussion

A total of 294 students responded to the survey, making a response rate of over 49.3%. Of the respondents, 56.4% are female and 43.6% are male; 87% are Hong Kong students, 9.5% are from mainland China, and 3.4% from Macao or other places. The information of age is collected in six intervals: 16~19 (13%), 20~22 (44%), 23~23 (20.1%), 25~26 (13.3%), 27~29 (6.8%), and above 30 (2.7%). The cohorts of students in the sample are evenly distributed: Bachelor Year 1 (18.1%), Bachelor Year 2 (22.6%), Bachelor Year 3 (18.1%), Master Year 1 (17.0%), and Master Year 2 (24.3%). The levels of burnout and commitment of this sample are reported in Table 1.

Table 1. Levels of burnout and commitment in the current sample (mean (SD))

EX	CY	IE	AC	NC	CC
3.28 (1.34)	2.01 (1.30)	3.07 (1.01)	4.96 (1.33)	4.03 (1.02)	4.60 (1.10)

Multiple regressions are performed to test the relationship between burnout and scores of commitment, and burnout and percentage of each types of commitment in the profile. The results are shown in table 2. All the three models are significant at 0.001 level. The first multiple regression was performed on AC using the three burnout variables as predictors. As model 1 indicates, all of the three dimensions of burnout were negatively associated with AC. Together, burnout accounts for 52% of the variance in AC. The result of the second model, on the prediction of NC, is similar to that of model 1, except that EX is not significantly related with NC. CY and IE accounted for 27% of the variance in NC. In model 3, the combination of EX and CY accounts for 15% of the variance in CC, both are positively associated with CC.

Table 2. Results of multiple regression models (controlling demographic variables)

	EX (*ß)*	CY (*ß)*	IE (*ß)*	*F*	Adj. R^2
Model 1 (dependent: AC)	-0.20***	-0.56***	-0.31***	33.95***	0.52
Model 2 (dependent: NC)	-0.06	-0.26***	-0.43***	21.57***	0.27
Model 3 (dependent: CC)	0.30***	0.17**	-0.09	11.01***	0.15

****p<.0001; **p<.001; *p<.05*

Overall, the results partly confirmed the hypotheses: all the three dimensions of burnout are negatively associated with AC; CY and IE are negatively associated with NC; EX and CY are positively related with CC. EX is not related with NC, but can poison the commitment profile by reducing AC and stimulating CC. IE has no influence with CC, but can worsen the commitment profile by eliminating AC and NC. CY is related with all the three dimensions of commitment, reducing AC and NC while increasing CC. The findings support the idea that burnout does not necessarily result in turnover, but may reduce productivity by de-healthilizing the commitment profile of individual students (Figure 1).

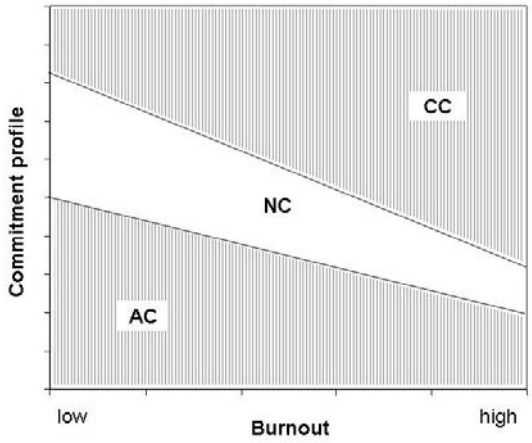

Figure 1 Burnout predict the 'healthiness' of individual commitment profile

5 Conclusion and further research

In conclusion, this study clarifies the relationship between burnout and different facets of commitment in student population. The present data support the idea that burnout does not necessarily result in turnover. As AC and NC decrease with burnout, CC increases to retain the burned-out students in the program. However, burnout de-healthilizes the commitment profile of students, shifting students' focus of learning from the task to the cost. Echoing the AIAS' calling for a change in learning culture "to produce healthier, more optimistic and more engaging architecture school graduates" (Koch et al., 2002: 4), this study from a management perspective suggests a need to prevent burnout and build up healthy commitment profile among architecture students. Intervention strategies should address the healthiness of individual's commitment profile rather than focus on single dimension or simply preventing turnover. Further study is needed to examine the relationship between student's commitment and the learning outcomes.

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Theme 6

Sustainability and Environmental Systems

Optimisation of Water to Cement Ratios for Recycled Aggregate Concrete

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Abstract:
The use of recycled aggregate (RA) from concrete waste presents some important environmental and construction engineering issues that need resolution. With poor strength and high water absorption rate, RA is rarely used in high-grade concrete applications; it is only restricted for use in roadwork sub-base, low-grade pavements, retaining walls and footpaths. This paper summarises experimental results on compressive strength, indirect tensile strength and flexural strength of recycled aggregate concrete (RAC) with different water to cement ratios between 0.4 and 0.6 for 30% RA replacement. The RA samples used are collected from a centralized recycling plant in Southeast Queensland, Australia. All the concrete mixes under investigation achieved at least 30MPa in compressive strength and 3.5MPa in indirect tensile and flexural strength for 28-day curing days. It is also found that the higher the water to cement ratios, the lower the RAC quality. Recommendation for the water to cement ratio for RAC production is about 0.4 to 0.45.

Keywords:
compressive strength, flexural strength, indirect tensile strength, recycled aggregate concrete, water to cement ratio

1 Introduction

Conservation environment is a major issue which can straightly relate with the survival of human race. Sustainable development plays significant role in modern requirement for construction activities. In Australia, approximate 42% of solid waste generation comes from construction and demolition (C&D) sector including metal, concrete, brick, glass, fitting and fixture from demolished or refurbished buildings, wood and wall paneling. Among different types of C&D waste, concrete was found the most significant element with about 81.8% (Productivity Commission, 2006). In Queensland urban centres, waste from C&D sites is the major component of the waste stream. On average, C&D waste comprises about 68% of the total municipal solid waste stream. Overall, C&D waste recycling in Queensland is not well established compared with other states in Australia (Environmental Protection Agency - Australia, 2007).

To minimize construction waste generated from construction activity, three main waste minimization strategies such as reuse, recycle and reduction are employed. Especially, concrete recycling is a method which has a number of benefits which make it an attractive option for greater environmental awareness, more environmental laws, and the desire to keep construction cost down. Furthermore, using concrete waste as aggregate can solve critical shortage of natural aggregate in the near future (Khalaf and DeVenny, 2004). RA could also be a reliable alternative to natural aggregate in the construction industry nowadays. The introduction of recycling in a waste management program mainly offers three benefits: i) softening new material resource demands; ii) reducing transport; and iii) production energy costs, and preventing landfill use (Tam and Tam, 2006).

Waste can instead be processed and reused as recycled materials for new construction work, i.e. reuse concrete waste as RA for RAC. RA is crushed from demolished concrete waste including stone particles attached to the old cement mortar as shown in Figure 1. RAC is produced by mixing RA with traditional ingredients, i.e. cement, water, fine aggregate and admixtures. At present, RAC application is limited to road and backfill work, general non-structural construction such as dikes, sidewalks, curbs and gutters (Grubl and Ruhl, 1998, Bakoss and Ravindrarajah, 1999, Sobhan and Krizek, 1999, Mulligan, 2002). This study aims to optimise water to cement ratios for RAC. RAC with water to cement ratios between 0.4 and 0.6 with 30% RA replacement are experimented. Mechanical properties of concrete such as compressive strength, indirect tensile strength and flexural strength are investigated.

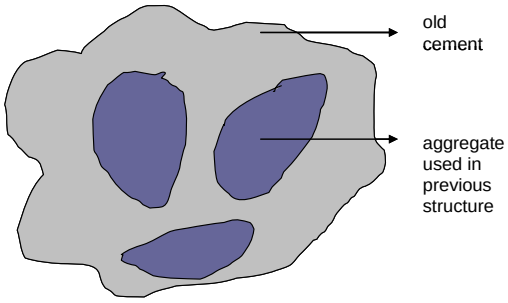

Figure 1. Recycled Aggregate (RA) (Neser, 2006)

2 Literature Review

There have been recent indications that RA is slowly becoming recognised as a high-grade construction material through the increasing numbers of research. In Australia, RA has been used in building construction such as foundation floor for The Melbourne Casino, Sydney Olympic buildings, and 100% RA in premix concrete at The Werribee foreshore in Victoria (Sagoe-Crentsil, 2005). A high school building in Norway has also been constructed by using RA in its foundation, basement walls and columns (Nelson, 2004). In the late 90's, two building projects made from RAC, the Waldaspirale and Vilbeler, were built in Germany by controlling the production process (Grubl *et al.*, 1999). 20% RA replacement was used in Holland in 1994 as the corresponding national

organisation admitted that RAC was found in no differentiation of the properties of fresh or hardened concrete (Oikonomou, 2005).

RA generally has lower density and higher water absorption values than natural aggregate (NA) (Larranaga, 2004). Many researchers highlighted that reduction in strength is higher in increased percentage of RA replacement (Ajdukiewicz and Kliszuzewicz, 2002, katz, 2003, Khatib, 2005, Levy and Helene, 2004, Poon *et al.*, 2004, Ryu, 2002, Sagoe-Crentsil *et al.*, 2001, Xiao *et al.*, 2005). There have been some studies concerned with physical and mechanical properties of RAC (Buck, 1977, Hansen and Marge, 1988, Hansen and Hedegard, 1984). With 100% RA replacement, Ravindraraj's study reported only a 9% decrease in compressive strength (Ravindraraj *et al.*, 2000). Yamoto et al's study found a massive 45% reduction in strength (Yamoto *et al.*, 1998). Frondistou-Yannas's study reported up to 40% decrease in strength (Frondistou-Yannas, 1977). Gerardu and Hendriks's study measured about 15% decrease in modulus of elasticity (Gerardu and Hendriks, 1985). It was found that compressive strength, tensile strength, flexural strength, and modulus of elasticity of concrete with 100% RA replacement is lower than the conventional concrete of about 4.90%, 18.14%, 20.28% and 30.71% respectively. All concrete types achieved at least 40MPa in compressive strength, 4MPa in indirect tensile strength and flexural strength, and 25,000 N/mm^2 in modulus of elasticity (Kotrayothar and Tam, 2007).

The strength on RAC can be improved by different methods and ingredient proportions. The 28-day strength can be improved by up to 20%, 27% and 10% in compression, tensile and flexural strength respectively. This was done by using a new mixing process namely, "Two-Stage Mixing Approach (TSMA)" (Tam, 2005). The TSMA divides the mixing process into two parts and proportionally splits the required water into two which are added at different times. It has been confirmed in 2008 that the TSMA can improve the 28-day compressive strength of RAC up to 4.3% when 100% RA replacement compared with normal aggregate concrete (NAC). While about 8.1% improvement in compressive strength was found when compared with the conventional mixing approach. The optimal mixture design would be about 20% RA replacement (Tam *et al.*, 2008).

3 Research Methodology

RA samples from local centralized recycling plant in Southeast Queensland (SEQ), Australia, are collected for the experimental work. All aggregate testing for its properties are tested according to the Australian Standards (AS1141, 1974).

RAC with water to cement ratios of 0.4, 0.45, 0.5, 0.55 and 0.6 are investigated in this paper. A mixing approach from the Australian Standards is used in this paper (AS1012, 1993). Ordinary Portland cement, designated Type GP (General Purpose) is used for the experimental work. A RA replacement of about 30% is used for mixing concrete as it is set as the maximum allowable RA replacement around the world (Yanagi *et al.*, 1993, Topcu, 1997, Masood, 2001, Xiao *et al.*, 2005) According to AS 1012, the mixing is first charged with about half of coarse aggregate, then with fine aggregate, then with cement and finally with the remaining coarse aggregate; water is then immediately added after starting the operation for two minutes (AS1012, 1993).

Specimens are cast from each mixture to assess their compressive, tensile and flexural strength according to the Australian Standards (AS1012, 1993). Average of three results is shown in this paper. All specimens are removed from the moulds after casting for 24 hours and cured under water at room temperature for 28 days. RAC mix proportions used for experimental work are summarised in Table 1.

Table 1. Mix proportions of RAC at water to cement ratios between 0.4 and 0.6

Materials	Mass Required per $1m^3$ (kg)				
	Water to cement ratio				
	0.40	0.45	0.50	0.55	0.60
Cement	400	400	400	400	400
Coarse Aggregate					
10mm	360	360	360	360	360
NA	252	252	252	252	252
RA	108	108	108	108	108
20mm	720	720	720	720	720
NA	504	504	504	504	504
RA	216	216	216	216	216
Fine Aggregate	720	720	720	720	720
Water	160	180	200	220	240

4 Findings and Discussion

RA properties are tested before using for concrete, their physical and mechanical properties are summarised in Table 2.

Table 2. Properties of recycled aggregate

Size (mm)	Particle density (t/m^3)	Water Absorption (%)	Aggregate crushing value (%)
10	2.34	5.55	22.11
20	2.42	5.23	24.64

Figure 2 and Figure 3 summarise experimental results in compressive, tensile and flexural strength. The 28-day strength of RAC decrease while water to cement ratios increase from 0.4 to 0.6 of about 34.06%, 26.24% and 4.64% for compressive, tensile and flexural strength respectively. The highest strength is found at a 0.4 water to cement ratio of about 52.64MPa and 4.84MPa for compressive and tensile strength respectively while flexural strength is about 4.63MPa at a water to cement ratio of 0.45.

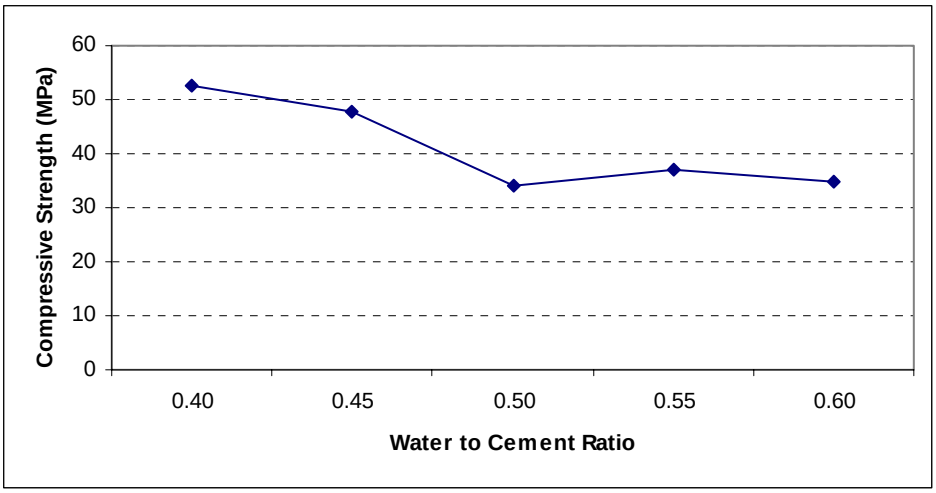

Figure 2. Compressive Strength of RAC at 28 days

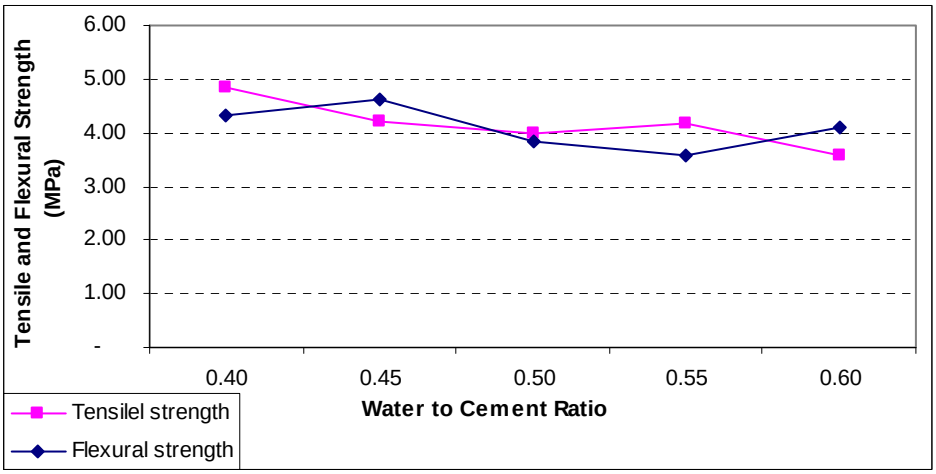

Figure 3. Tensile and Flexural Strength of RAC at 28days

The trends indicate that the highest 28-day strength of RAC is about 52.64MPa and 4.84MPa in compressive and tensile strength respectively at a water to cement ratio of 0.4 and about 4.63MPa for flexural strength at a water to cement ratio of 0.45. RAC strength reduces when the rates of water to cement ratios increase from 0.4 to 0.6 of about 34.06%, 26.24% and 4.64% in compressive, tensile and flexural strength respectively.

5 Conclusion and Further Research

This paper investigated RAC with water to cement ratios between 0.4 and 0.6. Mechanical properties of concrete such as compressive, tensile and flexural strength were examined. It was concluded that RAC manufactures which has 30% RA replacement inferior concrete strength as water to cement ratios increase from 0.4 to 0.6. It was achieved at least 30MPa in compressive strength and 3.5MPa in tensile and flexural strength from the samples It was also highlighted that water to cement ratios of 0.4 and 0.45 are provided the best results. In practice, concrete mix proportions with a

water to cement ratio of 0.45 is more suitable than the water to cement ratio of 0.4 by considering its workability.

Since RA has higher porosity and water absorption, more subject to deformation and mechanically, less resistant than the hardened cement matrix coating, the influences of the aggregate can affect the mechanical and physical properties of concrete. For further research to understand RAC behaviour, the wider range of water to cement ratios and different percentage of RA replacement should be investigated. Additional physical and mechanical properties and durability on RAC including modulus of elasticity, drying shrinkage and creep can also be studied.

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A Review of Literature on Knowledge Management Strategy - Lessons Learned for the Construction Industry and Research

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Abstract:
In business management, the management of knowledge has been touted as the way forward in ensuring the survival and resilience of organisations. But differing opinions abound as to how its strategies could be successfully managed. Despite the increase in adoption of knowledge management concepts in other industrial sectors, the construction industry has, arguably, been slow to adopt effective knowledge management practices and strategies, and exploiting the potential benefits of knowledge management concepts and initiatives. This paper reviews available literature on knowledge management practices and strategies in other sectors and attempts to reconcile these strategies with what pertains in the construction industry. The paper also discusses the importance of knowledge management to organisational survival and competitiveness. It proffers some suggestions as to the factors that are worthy of consideration for knowledge management strategies that could be of benefit to construction organisations. It concludes by drawing our attention to the complexities of factors impacted upon the success of knowledge management strategies and initiatives. It also argues that these complexities raise interesting challenges for organisations and for research strategies and designs used in examining knowledge management strategies and practices in construction organisations.

Keywords:
Knowledge Management, Organisational Strategy, Construction Organisations

1 Introduction

In business management, the management of knowledge has been touted as the way forward in ensuring the survival and resilience of organisations. In recent year, Construction Industry (CI) is confronted with more and more intense competition. In the midst of the expedited integration of the global economy, the competition is no longer the domestic market competition, but the global – scope international competition, so the pressure is greater than ever before. In order to stay competitive, construction organisations must still be innovative in reducing their costs and expanding their markets.

Knowledge has become the most important resource and key element of modern enterprise (Nonaka and Takeuchi, 1995). Knowledge is being recognised as a strategic resource and critical source of competitive advantage in today's dynamic and changing business environment (Gunasekaran & Ngai, 2007). The need for organisations to change continuously, innovate and confront new circumstances and become learning organisations is increasingly being recognised. The aim of Knowledge Management (KM) is to facilitate learning and the creation of new knowledge by teaching individuals where to find appropriate organisational knowledge, how to use and apply it effectively and to share and disseminate it appropriately (Mason & Pauleen, 2003). Organisational and individual knowledge is vital for business entrepreneurship and for managing change (Egbu 2000). Organisations that manage knowledge can evaluate core processes, capture insights about what they find, combine their skills and experiences, innovation and apply new ideas quickly (Egbu 2000).

The foregoing is also true for the construction industry. In the construction industry, KM is vital for efficiency in project delivery and improving organisational competitiveness (Egbu 2000). Effective management of knowledge in the construction industry is likely to produce innovation, reduce project time, and improve quality and customer satisfaction (Kamara et al. 2002). Through the process of KM, the exploitation of an organisation's intangible assets creates value and knowledge both internally and industry wide.

Failure to capture and transfer project knowledge lead to an increased risk of reinventing the wheel, wasted activity, and impaired project performance. These potential benefits of KM are, arguably, convincing enough for the construction organisations to venture into adopting its principles. However, differing opinions abound as to how KM strategies could be successfully managed. Despite the increase in adoption of KM concepts in other industrial sectors, the construction industry has, arguably, been slow to adopting effective KM practices and strategies, and exploiting the potential benefits of KM concepts and initiatives. For many construction organisation's, this perception has yet to take hold.

This paper provides a review of literature on KM practices and strategies from other industries and their potential benefits to the construction industry along with the complexities of factors that impact on the success and the associated challenges.

2 Literature Review

2.1 Knowledge Management

There are many definitions about KM. KM can be defined as a:

" the conscious strategy of getting the right knowledge to the right people at the right time and helping people to share and put information into action in ways that strive to improve organisational performance" (O'Dell and Jackson, 1998, p.4) .

The benefits and importance of knowledge and KM in terms of organisation are currently being widely acknowledged. Davernport and Volpel (2001) state that:

“It is already clear that KM is quickly moving into other industries, including financial services, manufacturing, even government and military organisations. In the future, we expect that every industry will view itself as knowledge- intensive and will adopt KM approaches in virtually every business unit and function”.

According to Sunassee and Sewry (2002), the implementation of an organisation’s KM strategy is only likely to contribute to the achievement of organisational goals and outcomes of it aligned to the overarching business strategy of the organisation. KM requires understanding, firstly, the organisation strategy under which knowledge will be developed and exploited; secondly, the content and kind of knowledge; thirdly, the organisational context and finally, technical context that supports the architecture of knowledge in the organisation (Martin & Casadesus, 1999). The major competitive advantage for an organisation lies in the organisation’s knowledge assets and therefore KM has become a critical issue .To understand what KM is, it is important to have a working understanding of the differences between data, information and knowledge.

Data is generally identified as a set of discrete facts about events (Davernport and Prusak, 1998). Most organisations capture significant amounts of data in highly structured databases. The core value activity around business data is the ability to analyse, synthesis, and then transform the data into the information and knowledge.

Information is the outcome of capturing and providing context to experiences and ideas. The core value building activity around information is managing the content in a way that makes it easy to find, reuse and learn from experiences so that mistakes are not repeated and work is not duplicated.

An understanding of knowledge is a foundation for effective management.

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knower’s. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms" (Davernport, 1998).

Nonaka and Takeuchi (1995) have used Polanyi’s (1967) concept of explicit knowledge and Tacit Knowledge in defining Knowledge dimensions. Explicit knowledge is easy to articulate, capture, and distribute in different formats. As for construction organisation’s, explicit knowledge is usually shown as the design drawing, design briefs document in data base, norms, the manual handbooks, the contract file of the project and construction records. All of which are easy to be stored and transmitted. On the other hand, tacit knowledge is that which involves tangible factors embedded in things like experience, values and personal beliefs (Barrett and Sexton, 1999). It is difficult to capture or share. Tacit knowledge is directly connected with ideas, values, emotions, perceptions and experience. Thus, the subjective and intuitive nature of tacit knowledge makes it difficult to be represented or transferred in a logical and systematic way. A few examples for tacit knowledge in construction industry include estimating and tendering skills, interaction with clients/customer and project team members in the construction.

But in a project, tacit knowledge gained from successful and failed projects in the past are often perceived as very important. It is difficult to be encoded. So it has to be transferred and shared. The major challenge is to convert tacit knowledge to explicit knowledge and vice versa, in a format that can easily be absorbed by construction firms (Barrett and Sexton, 1999). Since knowledge possessed by construction firms is significantly experiential and stored in people's head, tapping into this tacit knowledge by converting it to explicit knowledge is essential.

Organisational knowledge can be created through a continuous dialogue between tacit and explicit knowledge. There are four stages of organisational knowledge conversion, socialisation (tacit to tacit), combination (explicit to explicit), internalisation (explicit to tacit) and externalisation (tacit to explicit), (Nonaka and Takeuchi, 1995). Knowledge sharing will minimise the knowledge loss that will result in the event of a straight forward transfer of tacit knowledge to explicit knowledge form. It is the root of construction organisation's efficiency. The development sources of KM regards learning actualise lifelong education, innovate and strengthen the ability of construction staff. Understanding the relationship between tacit and Explicit Knowledge and its impact on the organisation leads to informed decisions on an organisation's KM approach.

2.2 Knowledge Management and the Construction Industry

In the Construction industry the importance of KM is increasingly being recognised (Carrillo et al., 2000). Within project based architecture, engineering and Construction, KM is also being recognised as a vehicle through which the industry can address its need for innovation and improve business performance (Egbu et al., 1999). KM is vital for efficient working in projects and for improving organisational competitiveness (Egbu 2001)

There is a growing awareness of the potential benefits of KM within the construction community. All organisations manage knowledge in some form. The emergence of KM as a business initiative is forcing people to think of what they are doing to better manage "What they know" (Carrillo 2004). Organizations can gain several benefits from implementing KM strategies. Tactically, they can reduce loss of intellectual capital due to people leaving the company; reduce costs by decreasing and achieving economies of scale in obtaining information from external providers; reduce redundancy of knowledge based activities, increase productivity by making knowledge available more quickly and easily and increase employee satisfaction by enabling greater personal development and empowerment.

The construction industry is a knowledge-based industry (Egbu & Robinson, 2005). It is diverse, being made up of different organisations, consultants and professionals providing a range of services for clients, customers and the wider community (Egbu & Robinson, 2005). KM has always been a challenge to the construction industry, which is predominantly a project-based industry (Kamara et. al 2000). Construction organisations have many reasons to practice sound KM initiatives. The construction industry faces several problems in managing knowledge due to its characteristic. The construction industry usually maintain some characteristics in the operation determined by their properties such as the high physical labour-intensity, the obvious function of

human factors, the low entry threshold for the staff, increased turnover of sub labour and has a short term temporary project based nature with considerable fragmentation, hence, most of the knowledge of the industry is generated in projects during the process to deliver a custom-built facility in accordance with the client's requirements and business objectives (Haichen et al, 2005). For the construction industry, KM is particularly important for the following reasons:

The capture and access to good (and bad practices) within project environments are essential to ensure better/improves project or service delivery of other projects. Since projects are in the main one-of-a-kind, there is no standard template or set of practices that is applicable to all. Though a generic set of processes and associated good practices may be considered, it is the unique processes and practices that are of value from KM perspective.

Consequently, each day on the construction site brings forth a new problem and a new solution. These problems and solution are rarely well documented and valuable lesson learned confined to the mind of only those who experienced them. The ability to manage the knowledge generated from the projects not only help prevent 'reinvention the wheel' and the repetition of the similar mistakes, but also serve the basis for innovation, overall improvement and sustaining competitive advantage (Haichen et al, 2005).

The job location for construction project often changes and the line workers are lost to other construction companies and are transferred frequently. The practical experience, tacit knowledge, is especially important to the work of construction. Similarly, the bid of the project, the management of materials and the supervision of the site are exceptially difficult to be got learn from books. The project based nature of the industry has made it particularly important to record and transfer knowledge from one project to another. Therefore, it is necessary for construction industry to accumulate the experience from construction and project management, which could be of benefit to training employee and for project cost reduction and subsequently be transformed to the knowledge assets of the organisation

Construction industry has low productivity and poor performance despite its importance in the national economy (Egbu et all, 1999).

Therefore, construction industry must adopt KM strategy to improve its management and for the purpose of survival in the intense competition. This industry, thus, is required to pay more attention to knowledge and KM than ever before, especially to tacit knowledge.

2.3 Application of Knowledge Management Strategy in the Construction Organisations

The primary objective of any corporate KM program is to support the achievement of strategic business objectives. In other words, the starting point for KM is to understand what the organisation's business objectives are. In order to be successful, KM must not be an end in itself, but must be a strong enabler to achieving real business results. This end is achieved by defining KM strategy for organisation that flows from and dovetails the business strategy. Knowledge strategies and km initiatives that are "stand-alone"

and not linked to business strategy are not likely to succeed. The key to defining and implementing a Knowledge Strategy that will lead to business results are steps such as fostering the corporate culture to encourage knowledge learning and sharing, Establishing technology platform, human resource management practice, organisational structure and leadership.

KM is an extremely complicated issue (Ruggles, 1998). It requires a profound understanding of numerous factors affecting the vicinity and environment of a construction industry. Other Industrial sectors have adopted this principle and several construction organisations have now formulated KM strategy, with the aim to continuously improve an organization's performance through the improvement and sharing of organizational knowledge throughout the organization.

A KM strategy sits at the top of any successful KM implementation. The success of any KM exercise heavily depends on the basic visioning and strategy. A strong vision helps a company keep an eye on the goal to be achieved, helping the success of KM to become more quantifiable and measurable. A visioning and strategic planning exercise enables organizations answer basic but important questions like – what do we want to achieve by implementing KM? Not many organizations have a definite answer to the strategic intent of a KM exercise, which is why they end up having a completely different system in place than the one planned for and which somehow nobody wants to use. For construction organisations, good KM practice require knowledgeable people who are supported by integrated information, data sources in order to generate informed decision-making (Sheehan et al, 2005)

One widely adopted classification of knowledge management strategies is from a study by Hansen et al. (1999) on KM practices in three service industries. They found two different KM strategies which are Personalisation and Codification strategy. The personalization strategy, focus on the tacit dimension of knowledge and assumes that knowledge is shared mainly through direct interpersonal communication. On the other hand, the codification strategy outgrows the knowledge and assembles it, and is in the form of codified explicit knowledge, coding information and storing it electronically in an organizational memory, which is convenient to employees to check.

Both strategies need IT support in terms of software and hardware at different levels. In the codification strategy, a company must use IT powerful to store big documents and with a search engine, so that it is convenient for people to check and download the document they need. But in the personalisation strategy, the most important system is where people seek help from others through it. The requirement of software and hardware is far less than the former. Some examples of knowledge management initiatives from other industries described in the mainstream literature are presented by Hansen et al. (1999).

However, before embarking on KM initiatives, the construction organisation's need to formulate appropriate KM strategy. The formulation of a KM strategy involves an examination of a number of interrelated concepts and factors (Kamara et al, 2000). In order to formulate KM strategies, Steyn & Kahn (2008) list five steps that are needed in order to be successful in managing knowledge; organisational culture, information and communication technologies (ICTs), Human resource management practices,

organisational leadership and organisational structure. Each of these five steps will be discussed in turn.

2.3.1 Fostering the Corporate Culture to Encourage Knowledge Learning and Sharing

Much creation and transfer of knowledge can be enabled by a knowledge oriented culture. Davenport and Prusak (1998) found knowledge-friendly culture to be one of the most important enabling conditions. Skyrme and Amidon (1997) stress organizational culture as an enabling necessary condition for knowledge transfer. Organizations can remove formal barriers to create a knowledge oriented culture (Skyrme and Amidon, 1997). It can then be assumed that various organizational arrangements can change the organizational culture. Instead of culture, (Hedberg, 1981) focuses on redesigning internal and external environments. He suggests a redesigned internal environment with conditions encouraging risk-taking and experimenting, which would enable learning.

Understanding the culture of the organisation is the first step that needs to be taken before implementing the initiative. The types of culture present in an organisation affect the ways in which KM is managed, and can, as a result either persuade or discourage the use of km practices. A KM strategy has to be carefully crafted if any knowledge 'silos' exist within the organization, where people don't share knowledge, resulting from fear of possibly loosing a competitive edge and hence a place in the organisation. A 'one size fits all' KM strategy should be avoided because this has produced consistent failures over time. Egbu et al. (2003) provided a list of various aspects of organisational culture that would support a KM initiative and at the same time they also recognised various aspects of a culture that may affect an organisation negatively. The culture must be geared towards rewarding innovation, learning, experimentation, scrutiny and reflection (Allee, 1997).

For creating an organisation wide culture of knowledge sharing and to institutionalise KM, it is critical for all employees to engage in km activities. In construction organisation's, employees should have a positive orientation to knowledge. That is, employees should be bright, intellectually curious, willing and free to explore and also employer should encourage their knowledge creation and use. Employees also should not be inhabited in sharing knowledge, that is, they should feel that they are not alienated or resentful of the company.

2.3.2 Establishing Technology Platform

Every organisation has a unique collection of knowledge assets and distinct business problems to which solutions must be applied. The platform composed of its infrastructure and applications must support the wide variety of need that arises. IT can provide an edge in harvesting knowledge from piles of old buried data repositories. Furthermore, Ruggles (1997) identifies the value of technology in providing KM to enhance and enable the implementation of sub-processes of km e.g. knowledge generation, codification, and transfer. This is also supported by Offsey (1997) who states that IT is clearly required to enable the organisation's km processes The rise of networking computers not only expands the range of knowledge sharing but also reduces the cost of knowledge transferring. It also has dispelled the communication hindrance caused by hierarchical and value notion when contracting face to face.

Technologies such as data mining and warehousing will help to encourage KM in modern organisations. It is important for construction organisation's to create room for experimentation, particularly with new technologies-blogs and online communities with wiki (open editing) technologies. There are many tools that could be used for KM, for construction organisation especially virtual project the uses of internet, group share system such as video conferencing, document management system, CAD systems, analysis system, estimating systems and etc will radically affect the speed and efficiency of knowledge generation and dissemination, In turns these will influence developments in working practices and social interaction. ICT helps to knit experts in each of these processes into communities and facilitates collaboration among member of these communities.

Carneiro (2000) suggests that a KM system should be developed as a response to changes in the internal and external environments. Carneiro (2000) explains that such a system is to be adapted to solve problems that negatively affect operating efficiency. However, KM is more than just the application of ICT for managing knowledge intensive application. Knowledge is predominantly a new way of thinking about modern organisation.

2.3.3 Human Resource Management Practice

A KM strategy must be firmly rooted in the human resources strategy as its success relies on being incorporated into the recruitment and selection process, staff learning and development, the performance management and rewards system, as well as being part of mobility and reassignment. Human resource strategy needs to bring people together so that they can build informal networks (Lubit, 2001)

Armstrong (2000) regards the role of human resource in KM as "to facilitate the dissemination of learning through workshop, projects and conference and later, to take responsibility for co-ordinating the preparation of business plans which incorporate the outcome of the learning activities". The main tasks of human resource management are to monitor measure and intervene in construction, embodiment, dissemination and use of knowledge by the employees (Soliman and Spooner, 2000). Therefore to succeed, a KM system ought to emphasise the management of these human relationships.

Knowledge sharing is not necessarily a natural process Thus, initially in implementing KM; it is encouraged to introduce corresponding incentive mechanism as rewards of knowledge sharing. Rewards and recognition scheme is needed in order to motivate people to share their knowledge. This can create interest, excitement and motivation among people, and ensure early adopters get high visibility so they serve as role models for others.

2.3.4 Leadership

When planning implementation of a knowledge management program, the organisation needs to consider whether to create a leadership role to develop and drive the process; For instance, a chief knowledge officer. Leadership is a crucial focus on establishing a culture that respects knowledge, reinforces its sharing, retains its people, and builds loyalty to the organization. Organisational management and leadership can also influence the outcome of KM strategy by influencing the nature of knowledge resources

present in the organisation, their deployment and their utilisation (Sunnasee and Sewry 2002). One of the most strategic leadership features is envisioning a preferred future and charting a way to get to that future. A knowledge vision provides corporate planners with a mental map of three related domains: the world they currently live in; the world they ought to live in; and the knowledge they ought to see (Von Krough et al. 2000). A knowledge vision should specify what knowledge that members need to seek and create. An era of the knowledge leader is emerging and is inevitable. It is through leadership that a successful KM initiative can be undertaken. Having a knowledge manager as a 'knowledge leader' can advance organisational KM initiatives.

2.3.5 Organisational Structure

The first important variable is leadership with a vision, strategy and ability to promote change. It is vital to have a compelling knowledge management actively promoted by the Chief Executive that clearly articulates how knowledge management contributes to achieving organizational objectives such as special team to aggressively manage knowledge property i.e., manage intellectual assets as routines-process, appropriate technology, infrastructure for ''social'' and electronic networking to allow for innovation and leverage organizational knowledge. According to Pinchot and Pinchot (1996), in order for knowledge to be utilised effectively in the knowledge economy, organisations will have to make a number of fundamental shifts in terms of organisational structure. These shifts includes a move from individual work to team work, from functional work to project based work, from single skilled personnel to multi skills employees and from coordination from above to coordination among peers.

2.4 Challenges in Implementing KM

Despite the popularity of the view that KM is a core component of competitiveness, KM remains a major challenge to construction industry. There are number of reasons why developing a smooth and effective KMS represents a considerable challenge. Most of the barriers to effective KM involve people. Human are complex with diverse psychological needs. Survey by Carrillo et al. (2004) ranked the main challenges faced in implementing knowledge management in construction organisations as:

1. Not enough time
2. Organizational culture
3. Lack of standard work processes and
4. Insufficient funding.

People are already busy, and sharing knowledge may mean changing the way they work or adding extra steps to the process of data and enter it into a repository. It is essential to create time and opportunities for people to learn. One successful approach is to create formal learning networks so that the identification and transfer of effective practices become part of the job. The greatest enemies of knowledge sharing are the time that is required to input and access information and the lack of motivation among potential users (Mayo, 1998).

Many writers have identified culture as a significant barrier to sharing knowledge (Carrillo et al., 2004). An inconsistent or non existent culture of sharing may exist in many facets of an organisation leading to poor knowledge transfer and workplace

openness and trust. In some instances, team members may be reluctant to share knowledge if they fear criticism from their peers, or recrimination from management. They may also be subversion of group efforts if there is a lack of respect, trust and goals. Reward systems are sometimes based on what personal background knowledge and individual effort, and may be a source of advancement within an organisation. One way to overcome this is to reward information sharing, but this can be difficult to measure. Once a reward system has been instituted, the quantity if knowledge share is likely to increase, but the quality may decrease (Scheraga, 1998).

At individual levels, people are often reluctant to share information. Professional knowledge is perceived as a source of power. There is sense of worth and status gained because of expertise. People tend to have felling "ownership" and hoard knowledge. There can also be feared that there will be a diminished personal value after giving up know-how (Hibbard & Carrillo, 1998).

According to Carrillo et al., (2004), lack of standard work processes is a problem with large organizations where, in some cases, they have grown rapidly and there are no longer standard procedures leading to different approaches being adopted. The low profit margins of construction organizations and their conservative nature have also led to reluctance to invest in KM initiatives and the infrastructure support required.

3 Research Methodology

This paper is based on a thorough review of extent literature. In the main, literature is drawn from different tradition and industrial sector. It draws on areas of knowledge management, innovation, competitiveness, organisational dynamic, organisational structural and culture. The articles reviewed for this paper have been gathered from journals, conference proceedings, books, monographs and web site.

4 Conclusion and Further Research

Developing a KM practice requires a well-balanced approach. KM is not an ultimate tool that solves all information and knowledge creation and transfer problems. However, by utilising KM, better performance can be achieved by interaction between individuals or groups. Consequently, even though KM is one of the most promising issues of the newly emerging knowledge era, it requires phenomenal change of understanding. If the construction industry intends to survive in the global competition, they have to give more emphasis to KM Strategy. Construction industry needs to begin to analyse their organisational knowledge. As a strategic asset, it is the key to competitive viability and growth of the learning organisation. The culture of the organisation is also critical element in determining the success or failure of any KM program. The new practice, thus, may improve business performance more explicitly and provide valuable insight on how knowledge may be strategically managed.

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Sustainability knowledge of professionals involved in PPP procurement and their influences on BREEAM ratings

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Abstract:
The paper uses the Building Research Establishment Environmental Assessment Method (BREEAM) to evaluate the environmental impact of buildings procured using the Public Private Partnership (PPP). PPP has the potential to act as a vehicle for delivering sustainable projects. Sustainable construction under PPP procurement may only take a foot hold if due consideration is given to the whole life cost (WLC) of assets, something which is reliant on the expertise and motivation of design teams. A sustainable driven agenda places huge demands on the skill sets of designers. Risks associated with WLC and the technical uncertainty of sustainable solutions may result in safe designing and discouragement of innovation. The objective of this study is to determine whether sustainability knowledge of professionals involved in PPP procurement influences BREEAM ratings. A literature review was undertaken and a survey questionnaire distributed. The population was professionals involved in PPP projects, and the sample comprised 82 people. There were 32 responses which were analysed quantitatively. It was found that knowledge levels do not influence BREEAM ratings; this is contradicted by the literature. More research is recommended based upon the new BREEAM tool which has been re-launched in 2008. Sustainability knowledge of design teams needs to improve.

Keywords:
BREEAM, knowledge, PPP, sustainability, WLC

1 Introduction

The need for intergenerational equity has never been more prevalent than in today's society; that is future generations should not be worse off than present generations. In 2005, the Kyoto Protocol was adopted as a protocol primarily designed to reduce Greenhouse gases. Although a large number of parties have ratified the protocol, fewer than fifty countries are actually required to reduce the level of their greenhouse gas emissions to accord with those prescribed within the treaty; the EU as a party in its own right is one of those countries. The level of effectiveness that the Kyoto Protocol is having on climate change is difficult to ascertain, but its inception and the level of subscription to it, points towards a legitimate need to harvest and use energy efficiently with minimal impact on the environment. This need is reflected in the manner in which

today's developing built environment is being procured and operated. There is a view that global warming is a threat which cannot be eliminated because human behaviour is something that cannot be conditioned, and the requirement to respond to societal needs has, and will, continue to exist. Although this may include an element of truth, the threat of global warming can be mitigated through development of sustainable facilities, services and infrastructures. It could be argued that through recognition of the need to develop an intransient legacy for future generations, the government has developed procurement routes which look to foster and promote sustainability.

Public Private Partnership (PPP) and Private Finance Initiative (PFI) procurement methods were simply developed to eliminate the immediate impact of projects on the public purse; do they now have the potential to act as a vehicle for delivering sustainable projects? Whilst PPP procurement routes look to cultivate sustainable solutions, all too often clients' budgets do not expressly allow for them. The common perception is that sustainability features are not rewarded in the selection of preferred bidders, even where they are asked for in performance requirements / specifications. It is questionable whether sustainability is championed in PPP projects with real vigour, and there is a danger that parties pay lip-service to it. Risks associated with WLC and the technical uncertainty of sustainable solutions may result in safe designing and discouragement of innovation. Clients specify BREEAM ratings in performance specifications for projects procured using PPP. The validity of the BREEAM tool has been questioned, and it has recently been redesigned. PPP contracts typically extend for 25 – 30 years; there is an opportunity to develop sustainable solutions through capture of originality within designs and designing with operational efficiencies in mind. However, situations can arise where risk associated with whole life costs (WLCs) and the uncertainty of sustainable solutions result in safe designs and discouragement of innovative designs.

The study aims to investigate the Kyoto Protocol and PPP as vehicles to develop a sustainable built environment. The objective is to determine whether sustainability knowledge of professionals involved in PPP procurement influences BREEAM ratings. There are two key variables identified: (i) the knowledge of professionals is classed as the independent variable (IV), and (ii) BREEAM ratings are classified as the dependent variable (DV).

2 Literature Review

2.1 BREEAM

The United Kingdom (UK) Office of Government Procurement (OGC) requires all government departments, when undertaking new or refurbishment construction projects, to carry out environmental assessments using BREEAM (BRE, The Building Research Establishment, 2007, p. 6). PPP is just one procurement route available to government, but by virtue of the OGC blanket policy, BREEAM applies to all PPP procured projects.

The BRE developed its rating as a method for assessing and scoring the environmental impact of projects (Addis and Talbot, 2001, p. 115), and it has now been adopted by public sector clients as a means for prescribing sustainability requirements. Projects are rated on a scale of 0 to 100. Measures are taken in nine areas: management, energy use,

health / well being, pollution, transport, land use, ecology, materials and water. Qualitative labels are given for minimum scores thus: 25% = pass, 40% = good, 55% = very good and 70% = excellent. BREEAM was re-launched in May 2008, and the revised version creates a new category of 'outstanding' for projects achieving a minimum score of 85%.

For PPP projects clients usually prescribe a rating of no less than ‘good’. Addis and Talbot (2001, p. 118) make the observation that the prescription of a BREEAM rating has the enormous advantage that it is very specific, very short and widely understood; it represents an unambiguous statement about the priority a sustainable solution takes in client agendas. This is a view shared by Edwards (2005, p. 120) who states that BREEAM is comprehensive and yet simple to use. However, BREEAM has faced criticism for its weak and bizarrely weighted ratings criteria (Kennett, 2008, p. 28). Kennett develops an earlier account to explain that disproportionate credits can be attained simply by installing lighting that meets current best practice guidance. Furthermore, factors unrelated to design, such as being close to a public transport hub, or quick fixes such as introducing bicycle racks or recycling systems, also secure high credits. These passive measures are items that should receive due consideration, but if architects, designers and engineers are adopting quick fixes, the weightings should perhaps be adjusted accordingly. Active measures for reduction of CO2 emissions need to be factored, so sufficient points can be accrued to attain reasonable ratings. There seems to be conflict in opinion about the level of detail that should be used in the calculation of BREEAM ratings. On the one hand (Blom, 2006, p. 3) notes the level of detail is relatively low, and Smith (2004) and Addis and Talbot (2001) observe that (consequently) it is high profile and has widespread appeal across the UK. There may be a concern that a drive to improve the validity of the tool, which will involve more complexity, may place a strain on the knowledge set of users that would diminish its attractiveness. It remains to be seen whether BREEAM 2008 is warmly received.

2.2 Performance requirements and the pre-bid period

As with all environmental tools, BREEAM is useful to clients, designers, constructors, users etc (Edwards, 2005, p. 121). For clients, BREEAM is of greatest use in conveying a statement to bidders about the sustainability aspirations for projects. These statements typically form part of the performance requirements for projects which are issued to prospective bidders during the initial stages of the PPP procurement process. The Private Finance Panel (1996, p. 9) supports this view in the account that the quality of bids received will be directly affected by the quality of information made available to bidders. The Private Finance Panel (1996, p. 9) also explains that such documents should not be prescriptive about the means by which requirements will be met; it is for consortia to offer proposals on how to best meet requirements. To put this in context, clients may have particular operational temperature requirements throughout the year; requirements that bidders would look to make provision for through development of appropriate heating, ventilation and cooling systems.

The competitive dialogue process, as part of smart PFI / PPP, is where any sustainability requirements would be established and responded to by clients and bidders, but as the Private Finance Panel has stated, the amount of regard given to

sustainable design solutions is commensurate to the level of information provided by clients in performance requirements.

Hill and Collins (2004, p. 25) believe that sustainability expectations should be detailed at the outset; the pre-qualification questionnaire should be used to indicate that clients will require sustainability competencies. This account finds synergy with the thoughts of other authors, but it is an approach which is destined to fail unless clients are suitably informed about sustainability issues. There is widespread opinion that all too often sustainability requisites for projects are being stipulated by people who do not have the appropriate level of knowledge. Knowles (1997, p. 3) remarks that one principal flaw on the clients' side is the lack of experience, direction and skills among the civil servants who are asked to deliver schemes. If sustainability issues are being greeted with ignorance by the public sector, then the account by Hill and Collins (2004, p. 3) is well founded, specifically that clients do not generally reward sustainability features in choosing preferred bidders, even where they have asked for such features in performance requirements – this is because the public sector does not have the expertise needed to provide fully considered briefs and critically appraise the response to these briefs.

The public sector is likely to garner the skill set needed to properly evaluate sustainability matters with the passage of time, but there is a risk that public buildings procured during this learning curve are not as sustainable as they could be. There is an evident need to secure the services of advisors during the procurement process who can furnish the public sector with the knowledge needed to successfully procure sustainable public services. Hill and Collins (2004, p. 25) assert: sustainability champions should be appointed at the board level of each client body, to ensure that project teams are giving due weight to sustainability goals and bringing in expertise where needed. Garwood et al (2002, p. 8) further support the view that clients need to secure consultancy specialist counsel. This consistent view finds unity with the ethos of smart PFI, which has matured through recognition of some of the problems which have challenged PFI. Smart PFI requires public sector clients to be better informed, and to undertake a higher degree of preparation, including design work, before going to market (Pringle, 2006, p. 72). Pringle (2006, p. 73) also comments that there is continuing evidence that procuring authorities are allocating insufficient resources to adequately prepare and develop their projects, and test their requirements before formal engagement with the market. This adds weight to the anti-PPP lobby argument that inefficiencies in public sector procurement are borne by taxpayers.

Even if performance requirements are more reliable, there is no absolute guarantee that the private sector will be able to respond appropriately. The adage that you are only as strong as your weakest link is accurate in so far as clients need to ensure that bidders are capable of providing a worthwhile response to performance requirements. Langston and Ding (2001, p. 126) comment that design must be understood to compromise the trilogy of form, function and cost. They also offer an assessment of the execution of 'green design' in their account that at best green design is an indulgence and at worst an expensive exercise. This is perhaps a consequence of a lack of ability when it comes to balancing form, function and cost.

2.3 Whole life costing

When considering cost, the term ‘value for money’ is perhaps more appropriate. Wilson (2005, p. 16) explains that government has re-confirmed that PFI / PPP should only be used where it offers value for money, and that procurement decisions should always be based on rigorous and unbiased reviews of which option offers best value for money. Hill and Collins (2004, p. 6) offer an account of how the public sector determines whether PPP projects offer value for money through discussion of the Public Sector Comparator (PSC) – a complex model used to calculate what projects would have cost without private involvement, based on past practice. The PSC does not however take into account the issue of WLC. A WLC or life cycle analysis will often consider capital, maintenance, disposal, replacement and management costs associated with a service or asset. There are obvious benefits to be reaped from identifying an economically sound life cycle proposal. Hill and Collins (2004, p. 12) explain that PFI allows contractors to take a different view on sustainability aspects; longer payback periods are possible because higher capital costs can be traded against lower operating costs.

Whilst WLC can promote a win-win situation there are pitfalls in the adoption of the concept. CIC (1998, p. 17) observe that PFI projects have to show savings for the transfer of risk. Life cycle analysis is entirely concerned with calculating the risk and offsetting it, but this exercise is not an exact science. A very attractive life cycle proposal may carry with it increased risk for the principal and facilities management (FM) contractors should an asset or service fail to reach its anticipated life expectancy. But if all risk is encapsulated in the bottom line offered to clients, the sum will be prohibitive thus supporting the CIC observation. Hill and Collins (2004, p. 16) refer to risk in their statement that 'the perception that sustainability costs more, may be due to not properly trading off capital and operating costs, and not giving appropriate consideration to risk'.

If due regard is not being given to risk in WLCs, this could be a contributing factor to ‘safe designing’, a reluctance to demonstrate innovation and offer green design. The literature suggests that there is a widespread perception that the least cost wins. Lane (2003) explains that people are looking at WLC, but it cannot be helped feeling that the most important thing is lowest capital cost. As with design, if sustainability ranks highly in the public sectors aspirations, WLC will be key to securing sustainable solutions at the right price. It does not cost more to be sustainable, it is about shifting the money around – taking it out of one area and re-allocating it (Cushnie, 2006, p. 44). To put this in context and demonstrate the effectiveness of WLC, Edwards and Bartlett (2001) offer a narrative on one PPP development in respect of its insulation provision. It was found that a 50% improvement of the roof insulation provision above the design brief would cost £21 000, but save £27 000 on the capital costs of radiant appliances on the top floor and £213 000 in running costs over the building’s life. Hopkins (2006, p. 10) does not appear to consider the value of WLC in the blunt assertion that 'PFI is one of a ragbag of privatisation schemes that simply puts large sums of public money into private pockets and to no good purpose'. The pitfall associated with the use of WLC as a tool for delivering affordable sustainable solutions appears to be the lack of knowledge of the people responsible for adopting it.

The Building Research Establishment (BRE) argues PFI bidders are getting more practised at WLC (Lane, 2003), but there appears to be much scope for more effective use.

3 Research Methodology

A questionnaire was used to measure both the knowledge of professionals (the IV) and BREEAM ratings of projects (the DV). The population embraced all professionals involved in the inception, build, handover and operation of PPP procured projects, specifically; local authorities, government agencies, developers, principal contractors, design consultants, architects and FM providers. The sample consisted of past or present colleagues of the lead author, recommended contacts or people identified during the course of the theory and literature review. They were all judged to have expertise in PPP. The sample could be considered a sample of convenience; it comprised 82 professionals. The questionnaire was piloted with three professionals. They were observed 'in silence' as they completed the questionnaire, and there were feedback sessions to give constructive criticism; minor corrections were made to the main survey instrument. It was distributed by e-mail. 32 responses were received.

Table 1. Survey questionnaire / knowledge statements - ticked box, not shown to respondents, indicates correct answer

Indicate to what extent you believe the following statements to be true T = true, PT = probably true, U = unsure, PF = probably false, F = false	T	PT	U	PF	F
The Kyoto Protocol; a protocol designed with the primary objective of reducing greenhouse gases, came into force in 2005.	✓				
The Kyoto Protocol expires in 2020.					✓
Only the European Union (EU) has subscribed to the Kyoto Protocol.					✓
The Department for Environment, Food and Rural Affairs (DEFRA) has set several sustainability indicators which accord with those detailed in the Kyoto Protocol.					✓
The acronym BREEAM means Building Research Establishment Environment Analysis Method.					✓
The UK Office of Government Procurement (OGC) requires all Government departments, when undertaking new or refurbishment construction projects, to carry out environmental assessments using BREEAM.					✓
BREEAM assesses the performance of buildings in nine key areas.	✓				
All new build properties are now required to achieve a BREEAM rating of no less than 'GOOD'.					✓
Under approved document Part L, there are no air permeability requirements for dwellings.	✓				
Under approved document Part L, a reasonable limit for the design air permeability of commercial premises is 10m3/h/m2.	✓				
Kingspan rigid cavity wall insulation products offer superior thermal conductivity when compared with Rockwool cavity fill products.	✓				
Organic insulation products offer superior thermal conductivity when compared with Rockwool cavity fill products.					✓
Insulation has the greatest potential for reducing CO2 emissions in construction.	✓				
Low emissivity coatings to glazed units can help reduce heat loss and also reduce solar heat gain during the summer months.	✓				
Approved document Part L prescribes that as a minimum, newly installed glazing must achieve a combined U value of 5.2 W/m2 K.					✓
Whole life costing (WLC) and life cycle assessment (LCA) tools lend themselves to the delivery of sustainable design solutions.	✓				

To measure the IV there were sixteen statements, selected from the literature, to which respondents were asked to indicate whether statements were true, probably true, unsure, probably untrue or untrue. These are detailed in table 1. The correct answers could only

be true or untrue. A correct answer scored four points. An incorrect answer scored 3, 2, 1 or 0 depending on how distant it was from the correct answer. The topic areas selected were the Kyoto Protocol, BREEAM, the sustainability performance of construction materials and government legislation. A combination of an equal number of truths and untruths were included. Each respondent was given a score; the maximum being 64 (16 questions x 4) and the minimum being 0. Scores are converted into a percentage, so that for example, 32/64 became 50%. A calculation was undertaken to determine, in the context of the difficulty of the questions, what might be a respectable score for a construction professional; this was determined to be 72%. Over coming years, this could reasonably be expected to improve.

To measure the DV, respondents were asked in the context of their last completed PPP project, to indicate what BREEAM ratings were prescribed at outset and achieved at handover; the lead author was aware that there are instances where what is prescribed is not always what is achieved. Respondents were asked for BREEAM ratings both on the 0 to 100 point scale, and the qualitative descriptions of good, very good etc. It was anticipated that scores on the 0 to 100 scale would not be known by all respondents.

Demographic data was collected in the questionnaire to enable checks of data homogeneity to be undertaken. Respondents were invited to give their own views about sustainability issues within PPP. These views are used to support discussion and conclusions. Inferential statistical tests were used to analyse the data using SPSS, including tests of internal reliability.

4 Findings and Discussion

The mean score for knowledge of professionals was 59.60%. The range was 43% to 78%. The BREEAM rating are shown in table 2. Only 26 respondents knew of the prescribed ratings; 8 were good, 15 very good and 3 excellent. Only 16 respondents knew of the handover ratings; 8 were good, 7 very good and 1 excellent. There were 2 projects that moved from a very good prescribed rating to a good rating at handover; no doubt this was considered to be disappointing by the relevant project teams. There were not any projects whose rating improved from prescription to handover. Few respondents were able to give BREEAM ratings on the 0 to 100 point scale, and therefore these are not considered.

Table 2. BREEAM ratings for respondents' last completed PPP project; prescribed in clients' requirements and actually achieved

		BREEAM ratings actually achieved at handover					
		Pass	Good	Very good	Excellent	Don't know	Total
BREEAM ratings prescribed in clients' requirements	Pass	-	-	-	-	-	0
	Good	-	6	-	-	2	8
	Very good	-	2	7	-	6	15
	Excellent	-	-	-	1	2	3
	Don't know	-	-	-	-	6	6
Total		0	8	7	1	16	32

The mean knowledge scores for each classification of BREEAM rating are shown in table 3. Eyeball observation indicates no significant differences; this is mindful of the small 'n' value for the excellent rated BREEAM projects. Mann-Whitney and Kruskal-Wallis tests confirm the eyeball observations, with the alpha value set at $p \leq 0.05$. The same tests were used to investigate data homogeneity, using the subject variables age and business type of respondents. No differences were found with p set at 0.05. However for age, the mean knowledge scores were 61.70% for those aged 44 or less and 55.30% for those aged over 44 years; this was significant with p set at 0.10.

That there was no relationship found between the IV (knowledge of professionals) and the DV (BREEAM ratings) was unexpected. It was hoped that improving knowledge could be used as a driver to improve ratings. However, the limitations of the study are noted in the conclusions. The knowledge score of professionals at 59.6% was not unexpected, particularly in light of some observations made in the literature. Shortfalls were identified in the knowledge of civil servants responsible for delivery of PPP projects and it has been argued there is widespread opinion that all too often the sustainability requisites for projects are being stipulated by people who do not have the appropriate level of knowledge.

Five quotes from practitioners give insight: (i) we have photo voltaics, wind turbines, excellent natural ventilation and day-lighting and high insulation levels but it is still a struggle to achieve very good, (ii) currently no commercial benefit to provide sustainable solutions, so market not likely to implement without 'carrot'. PPP not really the best method of providing sustainable solutions as risk factor of replacements sits with private sector and there is current high cost of supply, (iii) it is my understanding that additional insulation is only effective within limits and beyond this tipping-point the benefits only increase by an infinitesimally small amount no matter how much more insulation is added. I think we are now reaching the limits of economical and practical U-values in the building regulations and so to reach emissions targets, other measures will have to be implemented. Perhaps people should be encouraged to wear an extra layer of clothing and turn down the heating, (iv) when the 'chips are down', the affordability of projects impacts on willingness of funders to adopt sustainable design solutions, and (v) I am unsure that cost planning advice has got to grips with the financial implications of these new requirements and as such, I believe all new builds start with cost issues because of this. It appears that professionals were unable to fully understand and successfully implement WLC techniques. Cushnie et al (2006, p. 44) explained that WLC is key to securing a sustainable solution at the right price. If WLC is not being practised effectively, the result will be ‘safe designing’ and only ever obtaining BREEAM ratings of either good or very good.

Table 3. Mean scores and 'n' for sustainability knowledge of professionals; groups based on BREEAM score of their last completed project

	BREEAM rating classifications				R^5
	Good	Very good	Excellent	Don't know	All respondents together
BREEAM ratings prescribed in clients' requirements	62.90% n = 8	59.50% n = 15	57.30% n = 3	56.77% n = 6	59.60% n = 32
BREEAM ratings actually achieved at handover	62.50% n = 8	59.60% n = 7	43.75% n = 1	59.18% n = 16	

5 Conclusion and Further Research

BREEAM is a respected tool to measure the sustainability performance of buildings. There is a view that BREEAM assessment is over simplified, but to some extent simplification is necessary to ensure it has widespread appeal. It is hoped that the 2008 review of the tool will improve its validity.

Surveying the sustainability knowledge levels of public sector professionals is worthwhile, since it is important to know whether the public sector is specifying sustainability requirements from a position of knowledge or ignorance. Private sector professionals too need to be knowledgeable, especially when bidders are asked to work-up broadly specified clients' requirements into green designs. The actual mean knowledge score achieved was 59.60%, a respectable score was judged to be 72%. It is argued that knowledge needs to improve. Consideration needs to be made of methods to do this. Eight of sixteen projects only achieved a BREEAM rating of good; it is argued that 'all' projects should be achieving very good or excellent ratings.

The BRE has asserted that bidders are more practised at WLC, but it is probable that it is still not being considered sufficiently well for sustainability issues. The qualitative data reviewed illustrated a lack of understanding about the importance of WLC techniques. The literature suggests that WLC is key to securing a sustainable solution at the right price.

There is the possibility to improve the validity of study in this area. More comprehensive tools should be designed to test the generic knowledge of professionals. Population and sampling techniques should be reviewed. BREEAM ratings for projects could be better measured through direct contact with the BRE. The new BREEAM tool launched in May 2008 will no doubt ignite a new chapter in its life, but it is unlikely to improve actual ratings without a simultaneous improvement in the skill set and knowledge of professionals in two areas: (i) sustainability, and (ii) WLC. The research has established that too often WLC is embraced with apathy, which is summarised by a practitioner's remark 'when the chips are down, the affordability of projects impacts on willingness of funders to adopt sustainable design solutions'. It is argued that there is a need to develop the skill sets and knowledge of professionals in the fields of WLC and sustainability using a complementary methodology – one is ‘no good’ without the other.

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Future Practice of Climatic Design in Housing in Hot Regions: A Methodological Perspective.

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Abstract:
Climatic design has been promoted as an essential approach to achieving sustainable built environment. It is emerging as one of the important requirements to reduce environmental impacts and enhance human well-being. Design strategies in warm-humid climates have been explored by a number of researchers in a wide number of sources, however the application of climatic design in the contemporary Arabic countries in general and particularly in Libya is very rare. Within this background a research methodology has been designed with the aim of providing guidelines for architects to consider how to practice climatic design in creating architecture related to the local environment that can provide more sustainable solutions in hot climate regions with a particular focus on Tripoli. This paper will elaborate on the philosophical stances taken and methodologies adapted to fulfill these aims. The research philosophy adopted will be triangulation approach which is established to reduce the biases inherent in the case study strategy

Keywords:
Climatic Design, Research Methodology, Tripoli-Libya

1 Introduction

Climatic design is as old as the craft of building and art of architecture. Oliver (2003:9) in his book on vernacular architecture quotes Frank Lloyd Wright "Folk building growing in response to actual needs, fitted into the environment by people who knew no better than to fit them with native feeling". These ancient principles of vernacular building were used extensively until the early 1900s, when cheap energy and technological advances became available. In the 1950s and 1960s compact heating and air-conditioning equipment developed a high degree of comfort in any building in any climate (Thomas, 2006). However, perhaps as a consequence; the wisdom of designing in sympathy with the climate was too often ignored.

Passive climate control implies that the building is constructed and arranged in such a way that the thermal and hygroscopic properties of the building and its contents create a good stable indoor climate. It concentrates on building physics and as an underlying principle accepts that although the temperature and relative humidity may be maintained within acceptable ranges these parameters may stray outside the design code

requirements for limited periods. For most, passive climate control is a design principle where it is important for the architect and engineer to be aware of how the building is used. At the same time it is important for the user to understand the building and to be aware of any activities that could possibly have an unintended and inappropriate effect on the indoor climate (René et al, 2001).

According to Evans (1980) the shape of dwellings can be designed to obtain advantage of useful aspects of climate, and to reduce the impact of adverse aspects. Factors that should be controlled in relation to the needs of the climate zone are; the form, layout, orientation and scale of dwellings and dwelling-groups. Oliver (2003: 130) highlights the relation between building and climate: “Dwellings are built to serve a variety of functions, but one of the most important is to create living conditions that are acceptable to their occupiers, particularly in relation to the prevailing climates”. Paraphrasing Oliver, buildings do not control climate, which, apart from the wind or sun shadow that they cast, remains largely unaffected, but they filter the climate, to provide more moderated internal conditions. “The materials that are used, the forms they take, the volumes they enclose, and the services that are installed may all contribute to the 'micro-climate' that the house generates. This is not always precisely what the occupants require in temperature, ventilation or relative humidity.”

“The concept of passive climate control is completely in line with the notion of sustainable building. It is an alternative to a mechanical air-conditioning system and as such is an essential part of sustainable building” (René T. et al., 2001). Fathy (1986) described the problems facing people in hot and arid climates as “People living in the hot, arid climates, however, were faced with a different problem: high daytime and cool night-time temperature with very little humidity. ...., the solutions that were found relied on energy from the sun and wind and the innovative, architectural structure and forms that were developed to make use of this natural energy” (Fathy, 1986: xv).

This paper is a summary of PhD project focusing on the interrelationship between passive climatic design and local architecture in such situations. This part of the study attempts to discuss the importance of the research area, justification and contributions to knowledge as well as the process of the research methodology selection, undertaken to conduct the study.

2 Research problem

The research problem addresses the interrelation between climatic design, local architecture and the dynamics of change, development, environmental protection and sustainability. Many modern buildings in hot climatic regions do not perform well and require extensive use of mechanical systems, which consume energy. Much contemporary housing design in Tripoli is in the so called international style that reveals similar characteristics in almost every part of the world with scant consideration of the local or regional architecture.

This raises the question of what type of architecture is needed to take proper consideration of environmental principles and the nature of the place. This study will

explore whether Climatic Design can be used to address this problem by strengthening the interrelation between architecture and local climate.

3 Research aim and objectives

This research aims to provide guidelines for architects to consider how to practice climatic design in creating architecture related to the local environment that can provide more sustainable solutions in hot climate regions with a particular focus on Tripoli.

In order to achieve the aim of this research the following objectives are set:

1- To investigate the role of climatic design in providing a proper stable internal microclimate in a natural way.
2- To identify the characteristics of passive systems and natural energy in designing buildings and analysing the solutions of local architecture, housing and passive design systems in hot climate region.
3- To investigate the traditional and contemporary housing characteristics in Tripoli in order to understand how these houses perform in the context of current life style needs and requirements.
4- To examine the degree of householder satisfaction with both traditional and contemporary housing in terms of the internal microclimate.
5- To explore the opinions of design and construction professionals in terms of climatic design of modern housing for Tripoli society.
6- To sample the temperature and humidity inside selected local and contemporary houses to clarify actual internal and external conditions.
7- To compare the opinions of householders and experts on the preferred comfort conditions with the sample measurements taken in the houses, in order to understand and challenge the perceptions and expectations of comfort.
8- To establish a set of guidelines for designing new urban housing projects which use a combination of climatic design principles and contemporary technology to provide more environmentally friendly housing solutions that meet social needs and functional expectations.

4 Research questions

The main research questions are:

1- How to practice climatic design in future housing in hot climates in a way that reinterprets the best features of traditional and contemporary approaches and provides a housing architecture relevant to the environmental problems that are anticipated in this century?
To answer the main question, two other questions should be answered:
2- Why do we need climatic design and what are the underlying principals?
3- What can we learn from traditional housing solutions and can they deliver good performance for modern society?

5 Justification of the research

This research examines the influences of climate in designing buildings in Mediterranean climate zones and in Libya in particular. This area of work has been selected for the following reasons;

1- In modern building greater reliance has been placed on mechanical cooling and ventilation equipment to provide comfortable conditions. In the U.S.A. energy consumption in the building sector accounts for 40% of the total energy consumption (EIA, 2006), and 66% in Libya (GECOL, 2006).

2- In terms of the potential effect of dwellings on climate change, domestic heating and energy generation accounts for 81% of the total emissions of greenhouse gases with 78% of this being CO2 (IPCC, 2001);

3- Contemporary Libyan architecture is typical of a number of Middle Eastern countries, which now rarely recognise local climate, tradition, culture, or environment. Issues related to these subjects are usually neglected or rarely studied (Amer, 2007);

4- There is a strong risk that as the developing world industrialises, then it will follow more affluent countries and air-conditioning will become a user expectation and thus a standard feature in dwellings in hot climatic zones. If this trend remains unchecked this will raise energy consumption and CO2 emissions;

5- Therefore there is a need to search for a modern architecture that is suitable for hot climatic zones, that uses less energy intensive approaches and builds on natural or passive methods formulated through climatic and passive design principles;

6- Currently there is little research into the performance of, and user satisfaction with, buildings constructed using traditional and contemporary climatic design principles in Arab world;

7- As there are a number of traditional dwellings (which have intrinsically applied these principles) still occupied in Libya, then study of these buildings can help to identify whether these principles can deliver modern buildings that meet current user expectations and requirements.

6 Contribution of the research

This research is intended to make both academic and practical contributions as follows:
1- As mentioned in point 6 in the previous section, there is a shortage of empirical studies regarding the effective use of climatic design principles in the Arabic countries and particularly in Libya. The contribution of this research will begin to fill the gap in the literature on Arabic countries;

2- Climatic design has been applied in a number of western countries. The study will explore how these principles need to be developed and adapted for the Arab world;

3- The Libyan government has adopted new strategies towards sustainable urban development. Libya plans to develop the world's first eco-region, the 550,000-hectare site of desert and forest that extends inland from the Mediterranean coast of Libya is to be developed into the world's largest sustainable area by Sir Norman Foster (Brahic, 2007).

7 Research Methodology

The research philosophy adopted is a triangulation approach established to reduce the biases inherent in the case study strategy. Both positivist and phenomenological paradigms have been adopted to meet the requirements of this research where appropriate. The main reason for using both paradigms is that the subject is supported by an extensive theoretical background, focusing on the level of peoples' satisfaction and housing preferences and the measurement of thermal comfort inside buildings.

The research approach can be divided into the deductive approach and inductive approach Figure (1). According to Saunders (2003) the deductive approach is used to search for causal relationships between variables through deducing a hypothesis, and generalisation of the theory will not be expected as the inductive approach would be particularly concerned with the context of the research (Saunders et al., 2003).

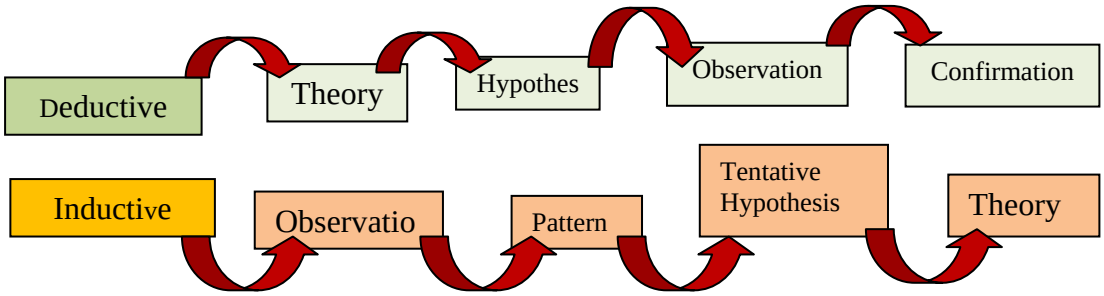

Figure (1) shows the different between the deductive and inductive approaches

A combined research approaches (inductive and deductive) has been selected for this research. In this research a theoretical framework is first confirmed from the existing literature which will be investigated in the case studies (deductive approach). Although this area is particularly well theorised, there is scope to improve theoretical framework of climatic design (in an inductive manner).

7.1 Research Design

The aim of the research design is to satisfy the research aim and objectives and to define the methods, approaches, techniques and strategies through which the empirical research is conducted and investigated in order to answer the research questions. Yin (1994) says that research design "guides the investigator in the process of collecting, analysing and interpreting observation. It is a logical model of proof that allows the research to draw inferences concerning causal relations among the variables under investigation". Trochim (2006) stated that research design provides the glue that holds the research project together. To answer the research questions the logical plan involves

certain steps which are meant to address various aspects of the questions and achieve the research aim and objectives.

One of the major classification systems concerned with research methods is that of quantitative and qualitative research. The research design adopted is both qualitative and quantitative using both the literature and statistical data from surveys of case studies which will be compared to draw conclusions; figure (2) illustrates the research design. Yin (1994) lists several examples along with the appropriate research design of each: exploratory, explanatory, and descriptive case studies. He points out that case study are the ideal strategy when focus is on a contemporary phenomenon within some real-life context and when the investigator has little control over events. Also he emphasises that there is no single source of evidence that has a complete advantage over all the others, however, interviewing is found to be the most widely used data collection technique in a qualitative approach for its high level of flexibility and its capability of producing data of a great depth (Yin, 1994).

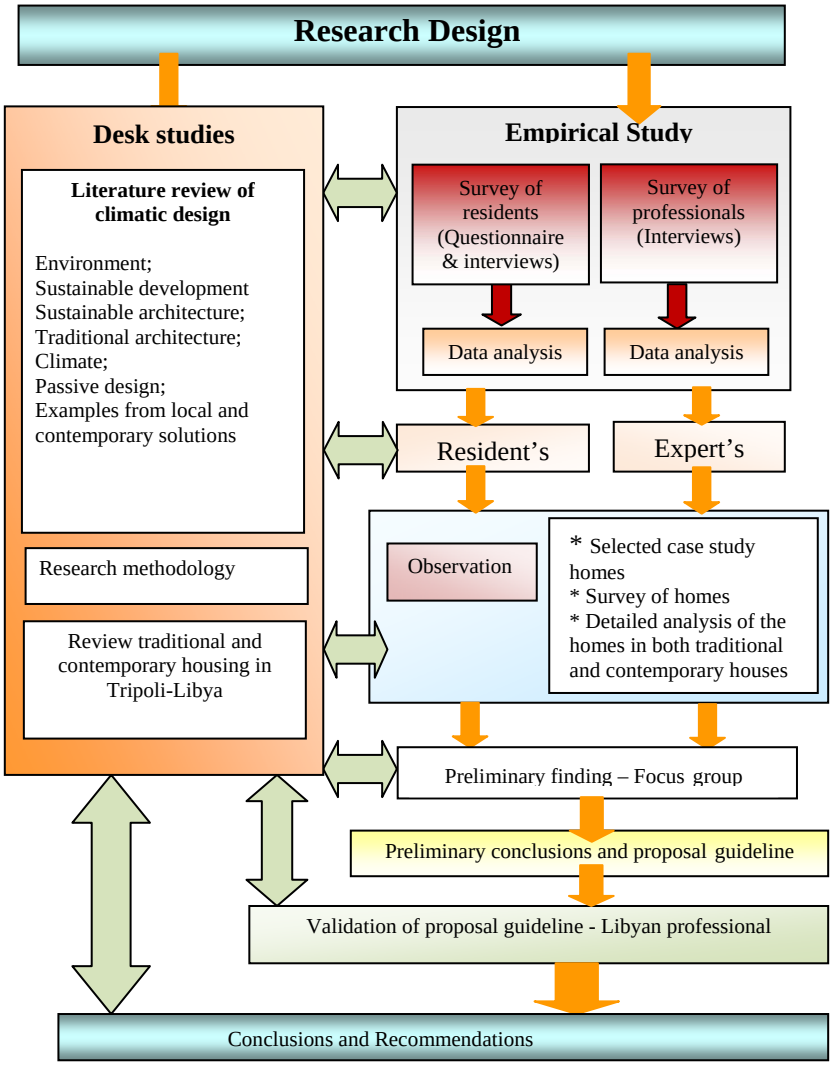

Figure (2) the Research Design

An interlinked set of case studies will be adopted and a selective sampling, rather than a random sampling strategy will be explored for appropriate selection of the cases. According to Yin (2003) case studies are used because the authors want to cover contextual conditions, believing that they might be highly relevant to the phenomenon of study. Tellis (1997) Addressing the variables within the research objectives will be achieved through detailed cross case assessment, supported by descriptive statistical analysis.

7.2 Data Collection Methods

Data collection refers to the methods that are used to collect the information required. There are two main options: fieldwork (primary data collection) such as survey interviews and questionnaires and desk study (secondary data collection) such as journals, statistical or descriptive format (Nauom, 2007). In order to achieve specific research objectives, a combination of research methods may be more effective. Saunders (2003) states that combining the two approaches is possible as it will enable the researcher to collect benefits from both.

This research depends on using methodological triangulation figure (3) which helps contribute additional knowledge to the research and in that way different methods complement each other. Each of the different methods (questionnaire and semi-structured interviews, as well as direct observation, sampling and the collection of supporting documentation) will help capture a more complete, holistic and contextual portrayal of the cases and reveal the varied dimensions of the best way to conduct passive design in our future housing. Moreover, methodological triangulation can be employed in both quantitative validation and qualitative inquiry studies.

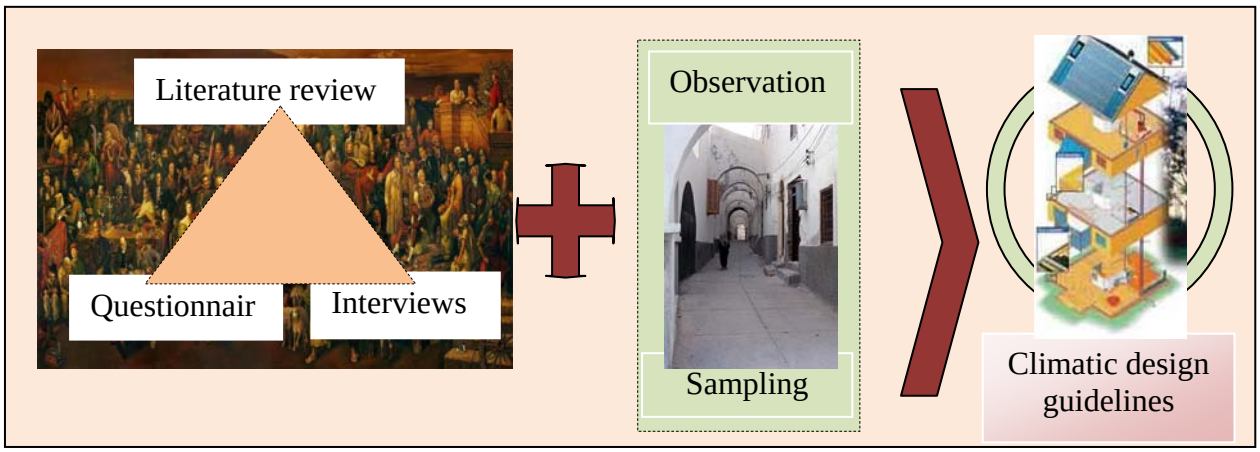

Figure (7.2-1) Illustrating data triangulation

The following data collection strategies will be used in this research;

1. To review the relevant literature of the environment, sustainable urban development, sustainable architecture, vernacular architecture and climatic design and its role in creating more environmentally friendly solutions.

2. Residents know their housing situation better than anyone else. A survey of residents has been undertaken to understand their attitude towards traditional and contemporary housing in terms of their degree of satisfaction about the house design, its comfort, layout concepts, function, building materials, suitability and problems.

Questionnaires have been used to collect householder's views of both types of housing. These were completed by interviews with householders from two case study areas located in different parts of the city: first, Tripoli old city and second, Tripoli contemporary city. The survey was carried out during July and August 2007 and August 2008. 'Purposive sampling' technique was used in the survey so that the study would gain the most valuable data from specific people. 50 questionnaires were distributing in advance of the interview in the contemporary area of Tripoli and 20 in Tripoli old city. Respondents live in a range of house types including villas, apartments, flats, small houses etc.

The nature of conducting interviews and questionnaires in Tripoli needs explanation. The strategy used in distributed the questionnaire in the old city was to visit with a friend who has been working in the area (for the institute responsible for conservation) of the old city. This is for security and social reasons, the author would have been seen as a stranger and distrusted, as well as helping in collecting the answers because the number of Libyan families in the old city is small and it is difficult to find the address of each family. The author used contacts in each area in identifying suitable respondents and to explain the meaning of the questions. As shown in figure (4) the total numbers of questionnaires completed were 54 out of 70 distributed in the two sites: 20 questionnaires in the old city and 50 in Tripoli. Some of the questionnaires were not completed and some of them were lost by the respondents.

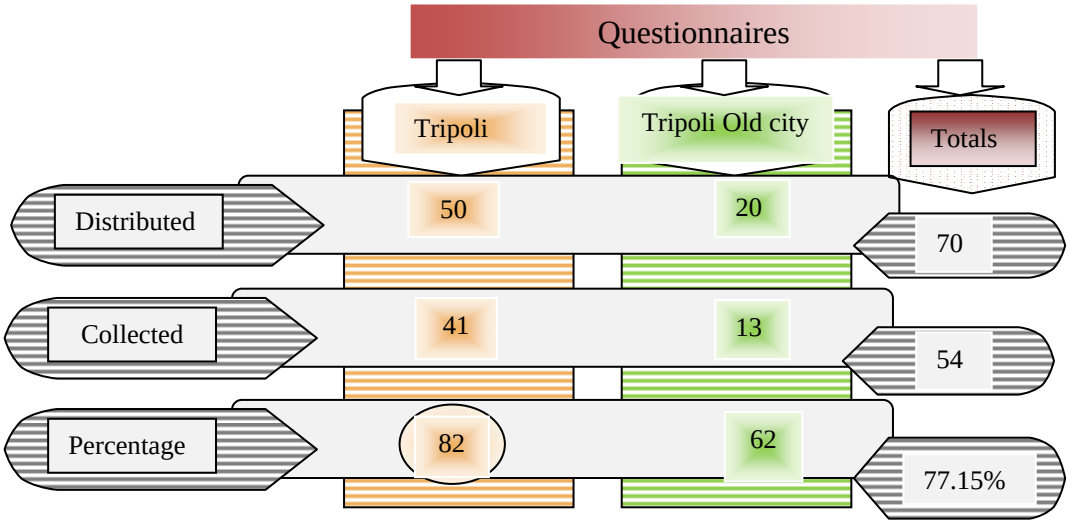

Figure (4) illustrate the questionnaires strategies

3. A semi-structured, face-to-face interview technique was being used to collect the necessary data from the professionals and to understand their opinions of current and traditional housing. The reason for using interviews is to discover other local issues not addressed in the literature and to explore their knowledge of climatic design. Also to

know if they use, or have tried to use this approach and what they think of the suitability of traditional buildings in comparison with contemporary design. Four members drawn from each professional group (architects, planners, mechanical and electrical engineering and specialists in properties of materials) who deal with real housing problems were to be interviewed.

The interviews used open-ended questions consisting of different numbers of questions depending on their individual specialism of the professional in order to explore their opinions, as well as to give their advice about how to find solutions to the housing problems in Tripoli and it's relation to climate and sustainable housing.

4. Two case study houses were selected as appropriate research vehicles for further investigation in each housing area. The purpose of this detailed study was to understand the reasons for the residents and experts views of the performance of these building in more detail. Detailed analysis of the houses was undertaken by collecting base data, for instance, the design concepts, layout drawings, equipment details of the systems of cooling and heating, building materials and methods of construction. This was supported by sampling the interior temperature to compare with residents perceptions of the conditions. Samples will be taken in summer and winter conditions.

The researcher intends that the survey results will fulfil the objectives of the study and deal with valuable issues that can help to frame better planning and building design.

8 Location of the Case Studies

For the purposes of this research Tripoli figure (5) has been chosen as the location of the case studies because of the following;

1- The old city of Tripoli is one of the cities in North Africa where the geographical and climatic characteristics are similar to those in the Mediterranean region.

2- The cultural conditions are typical of those in most Moslem and Arab countries.

3- It is the capital of Libya, where about 40% of the total Libyan population resides, and data is available on the housing situation in the city.

4- Its old city is still in a good condition and provides good examples of local architecture figure (6) whereas the old cites in the Mediterranean region have been almost destroyed. In fact there remain a number of traditional houses in Tripoli, which are largely unaltered from their original built state 'some of these buildings built before four centuries', are well maintained and still occupied.

5- There are ranges of good examples modern construction figure (7) to use in comparison with the traditional dwelling forms.

6- The researcher's professional experience is in this area and has contacts with agencies and construction professions.

The location of the contemporary and old city case studies is shown in Figure (5). Figures (6,7 and 8) shows typical examples of each house (traditional – contemporary).

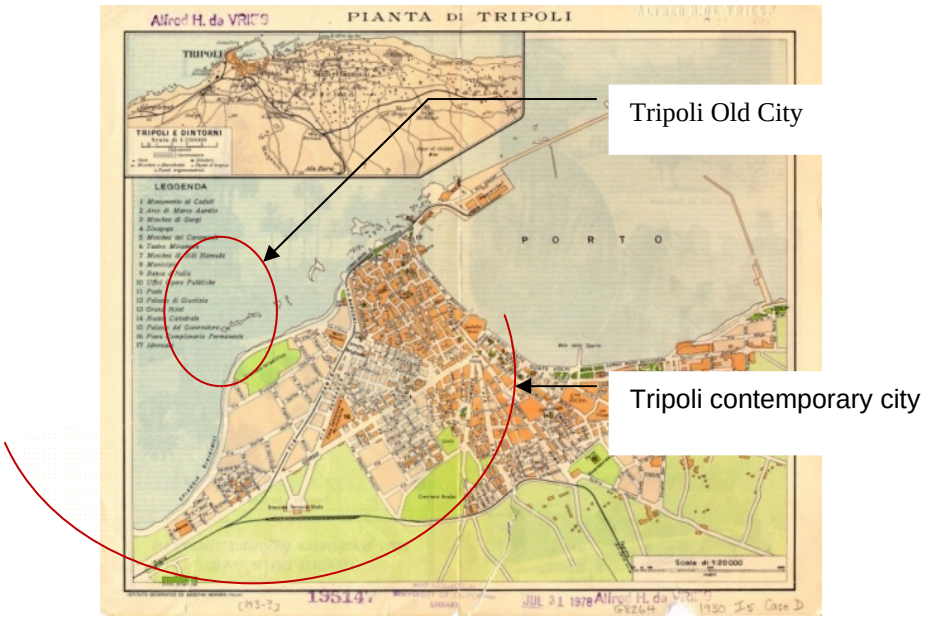

Figure (5) Tripoli master plan was provided and approved in 1936 by the Italian government. (Source: http://www.lib.berkeley.edu/EART/maps/tripoli.jpg).

Figure (6) Tripoli traditional house

Figures (7 and 8) Tripoli contemporary houses

9 Preliminary Findings

The preliminary results from the field study show that the professionals' opinions confirmed the importance of climatic design and its role in reducing the environmental problems, energy consumption and provide a special identity. They also accepted 'from a climatic point of view' that vernacular architecture is much more climatically friendly than contemporary architecture because it gave the best solution for that time. Although, these buildings may not meet the residents' needs nowadays as a consequence of their new life style, still lessons can be learned from vernacular architecture in order to improve the main features of contemporary architecture such as 'the concept design, building materials and methods of construction' to provide new kinds of buildings which have a spirit of the past and a projection of the future.

The residents' stance varies between those that accept vernacular style and those that prefer the contemporary one, they feel that the vernacular style is good at certain times but currently it is difficult to live in because of the following reasons:

* The position of the courtyard in the middle of the house is not appropriate; it is difficult in both summer and winter time to move from one space to another.

* The rooms within the house are usually rectangular in form; the size is about 7m ×2.5m which is not comfortable.

* Difficult to use air conditioning.

* Many people wanted to emulate the modern type and saw their own houses as old fashioned style.

* People associated the courtyard house with poverty, slum areas, lack of facilities, outmoded style and inadequacy of services

Most of residents believe that there are many positive points in the vernacular architecture but according to the new lifestyle they consider that these houses need improvement to meet their needs. Both the professionals and residents confirmed that there are many advantages that contemporary architecture provide such as more comfort, flexibility, privacy, area and possibilities to use new technology.

These preliminary findings show the importance in doing in depth study about how to avoid the problems of vernacular architecture and use the advantages of both vernacular and contemporary architecture in future developments.

10 Conclusion and Further Research

The main concern of sustainable housing is to meet the accommodation needs of today's society whilst at the same time ensuring that the environment is protected, thus ensuring that future generations have the ability to meet their own housing needs.

This paper summarises the research methodology used to determine the use of climatic design as a tool to create a comfortable, energy-efficient and an environmentally wise built environment in hot climate regions. It first outlines the research aim and objectives, the research questions and a justification for the research drawn from literature; secondly, it presents an overview of the research methods, methodology and data collections and finally; it presents preliminary findings that confirm the importance of climatic design and the need to learn lessons from vernacular architecture.

The advantages of both vernacular and contemporary architecture, in addition to the new solutions offered by passive climatic design, could help to provide more sustainable housing.

To further advance the key aim of this research, recommendations for future studies in the field are suggested as follows:

1 - Using and validating specialist software such as 'ECOTECT' by evaluating the internal thermal comfort conditions expected in old and contemporary buildings and comparing with real measured data;
2 - Examining the findings of this research by designing a building model and testing it within the 'ECOTECT' dynamic thermal simulation software;
3 - Repeating this methodology in other different climatic regions (e.g. mountain and desert).

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The Code for Sustainable Homes: what are the innovation challenges?

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Abstract:
The UK government has set timescales for the house building industry to significantly increase the number of new homes built and to improve the sustainability performance of these as defined by the Code for Sustainable Homes (CfSH). These dual requirements are generating a range of demands that require a corresponding range of innovative solutions. There is considerable uncertainty within the house building sector on the focus, scope and intrinsic risk of these innovation challenges. There is an urgent need, therefore, for this uncertainty to be transparent and calibrated. This will enable house builders to channel and optimise their innovations to meet government targets whilst developing new sources of competitive advantage. This paper sets out and substantiates a theoretical framework developed from the relevant literature that identifies and links the issues that house builders need to consider if they are to deliver against the dual requirements of sustainability and increased quantity. The questions generated by this theoretical framework are informing ongoing case study research on sustainable housing and innovation being carried out by the Salford Centre for Research and Innovation in the Built Environment, and the methodology for this work will be described.

Keywords:
Innovation, sustainability, UK house building

1 Introduction

The focus on sustainable housing is part of a broader international agenda to reduce the impact of climate change and, in so doing, move towards a more carbon-neutral global economy. The United Kingdom (UK) government has published a range of policy initiatives to address the issues. These include the Code for Sustainable Homes (DCLG, 2008) (CfSH) as a focus for the house building industry to achieve a high level of sustainability for new homes. The industry will need to develop and deliver a flow of successful innovation in order to achieve the dual goals of meeting the objectives of this policy and sustaining competitiveness.

This paper puts forward a diagnostic model that aims to structure the investigation of the significant challenges for house building supply chains that stem explicitly from the

implications for the scale and speed of innovation needed to achieve the higher levels of the CfSH ratings within the government's timescales.

An ongoing case study into the construction of 52 homes for a housing association client by a major housing developer, which will test the model proposed and map the processes of innovation needed to deliver these homes, is described along with the research methodology.

2 UK housing context

Sexton and Barrett (2003) define the factors that are critical to firms' successful innovation and these include a considered awareness of the external or "given" environment. This is the business context that firms are influenced by, but which they cannot influence themselves. The current "given environment" for house builders is driven by government policy on three specific issues, summarised by the Department for Communities and Local Government (DCLG, 2007) that, in turn, are responses to broader global and national circumstances. These represent the defining framework within which the house building industry now needs to operate.

Volume. Three million new homes are needed by 2020 (bringing housing stock to c.25 million in England). This will be achieved by building increasing volumes of homes every year, rising to 240,000 a year by 2016. (DCLG, 2007: 6)

Quality. The sustainability of new houses is a key element of the policy commitment to build well-designed homes for mixed communities with good local infrastructures to support them. (DCLG, 2007: 8)

Price. The average house costs over 8 times the average salary and by 2011, 70,000 new homes a year will be "affordable", for either rent or purchase. (DCLG, 2007: 9)

These three are expressed as parallel policy objectives in government documents and can be summarised as more, better and cheaper housing. However, as well as satisfying national and local government requirements, housing developers, operating in market conditions, also need to manage viable and profitable businesses and there is a tension that underpins the two of the three key policy objectives of "better" (quality) and "cheaper" (price). Based on data in the government's policy statement (DCLG, 2007: 22) it has been estimated that the construction of a low carbon, sustainable home may add 30% to the average building cost and £25,000 to the price for buyers (Miller 2007). The policy objective of volume is compromised by the capacity of the sector, for example in the 12 months to June 2008, 161,000 new homes were completed in England (DCLG, Aug 2008: 2), far below the 240,000 annual target set by the government. Capacity is further reduced by the downturn in the economic climate in late 2008. The urgent need for the industry to develop and apply appropriate innovation to satisfy the apparently conflicting drivers of policy and business is clear, and requires timely academic support in order to clarify and calibrate the implicit challenges.

As a "given environment" for the house building industry, all three policy objectives need to be addressed as new (or recent) drivers that will generate, or at least accelerate, a flow of innovation to meet the government's targets of more, cheaper and more

sustainable homes. At the same time, developers continue to work within the framework of existing regulations such as Building Regulations, the central and local government requirements that regulate all house building projects, and any parameters that are relevant to individual projects.

3 The Code for Sustainable Homes

The policy objective of better quality housing includes the Code for Sustainable Homes (DCLG, 2008). The CfSH has been introduced in England by the government to address the need for new homes to be "sustainable". "Sustainability" is variously identified in the Code, though not specifically defined, as a minimisation of CO2 emissions, reduction of other environmental impacts of house building and an improvement of overall well-being & quality of life (DCLG, 2008: 2). The Code is a mandatory single national standard that rates "the whole home" against a range of nine "sustainability" criteria to give an overall 1 to 6 rating, where 6 is "highly sustainable". The requirements of the nine categories of the CfSH (energy and CO2 emissions, water, materials, surface water run-off, waste, pollution, health and well-being, management, and ecology) add extra design requirements for the house building industry.

4 The innovation gap

A definition for innovation that is appropriate for this research, reflecting a concept of a number of firms innovating on a project basis to meet the urgent challenges of high level CfSH housing is based on key government sources. The UK government's aim is for the construction industry to "enhance [its] capacity to innovate and increase the sustainability of both the construction process and its resultant assets" (BERR, 2008: 44). The Economic and Social Research Council define innovation as "the successful introduction of new services, products, processes, business models and ways of working" (ESRC, 2008: 2) and the Department for Business Enterprise and Regulatory Reform stretch this to specify "the successful exploitation of new ideas" (BERR, www.gov.uk/dius/innovation/). These reflect the breadth and application of innovation that will be needed to meet the challenges of house building at higher CfSH levels. An amalgamation of the key elements of these definitions encompasses the successful application of a flow of significant and effective innovation, for projects which meet the criteria for higher-level CfSH housing, and which represent a sustainable business asset.

Within the CfSH the challenge for innovation is implicit in, for example, the requirement for a 100% reduction in CO2 emissions for all new homes by 2016, with staged reductions of 25% by 2010 and 44% by 2013 (DCLG, 2007: 65), based on improvements on Building Regulations Part L 2006. However, there are several examples of small-scale private housing developments that demonstrate various elements of sustainability (for example the Living i development by Persimmon Homes, www.living-i.co.uk). Developers have also been building and renovating homes for the social housing sector to the standards defined by the EcoHomes environmental performance standard since its launch in 2000, where meeting the highest level of "Very Good" is a forerunner of, though does not equate to, CfSH level 3 (HC, 2007: 10). Appropriate innovation has been developed and applied in the construction of these

homes and would indicate that, if innovation to achieve CfSH level 4 or higher is a process, then this process has already begun.

5 Diagnostic model

Sexton and Barrett (2003: 627) developed a model to clarify the business components that are necessary for successful innovation. It included the central organisation of work as a focus for the three-way relationship between technology, human resources and business strategy (see Figure 1)

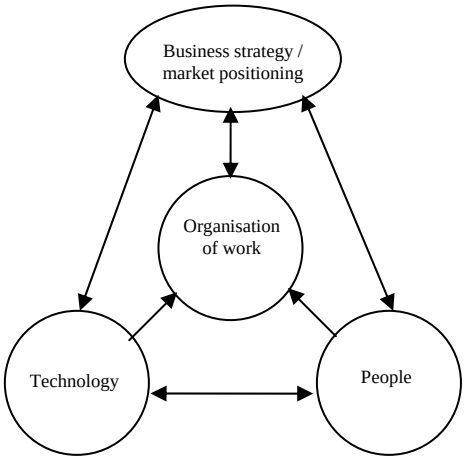

Figure 1. Organisational factors of innovation model.

This has been multiplied to provide a diagnostic model for the case study (see Figure 2). The model shows Sexton and Barrett's triangle of the organisational factors of innovation multiplied for a constellation of firms sharing a common purpose of the successful delivery of CfSH4 housing. Each firm has its own perspective of the project and will organise its people and technology in line with business strategy to develop and adopt successful innovation to meet their part of the project. At the same time, firms need to continue to compete, and sustain competitive advantage, within their own specialist markets.

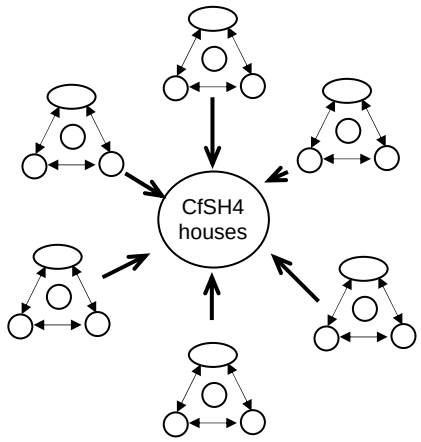

Figure 2. Project-based organisational factors of innovation

6 Research Methodology

The case study, which is in its early stages, centres on a housing development of 52 CfSH4 homes. Figure 3 summarises the issues and methodology of the study, showing the progress of the development project through a series of decision-making processes by the organisations involved in planning, designing and delivering the 52 homes. The diagnostic model at Figure 2 illustrates the balance needed for a successful outcome, and the case study will include an examination of the effects of any inherent or unplanned weaknesses either in the links within organisations' individual "triangle" or in the focus on the project objective of CfSH4 homes.

A series of semi-structured interviews with members of staff from the designer, developer, client, engineer, local authority housing and planning departments, the regional Housing Corporation and the Highways Agency will explore perceptions and perspectives on achieving CfSH4 homes, supported by a review of project documentation. Interviews are scheduled to take place during November and December 2008, with subsequent analysis during early 2009. Transcripts will identify business cases, performance indicators and measures of success, and the process and decision-making maps for the construction project. Cross-case analysis of the reports will identify shared and unique perspectives on the processes and systems currently in place that support or create barriers to the innovations needed to successfully deliver CfSH4 homes. This will inform a debate of the issues and challenges of the innovation needed to achieve CfSH4, identify any priorities for improvement in existing systems and processes and finally discuss an evidence-based critique of the CfSH as a government policy.

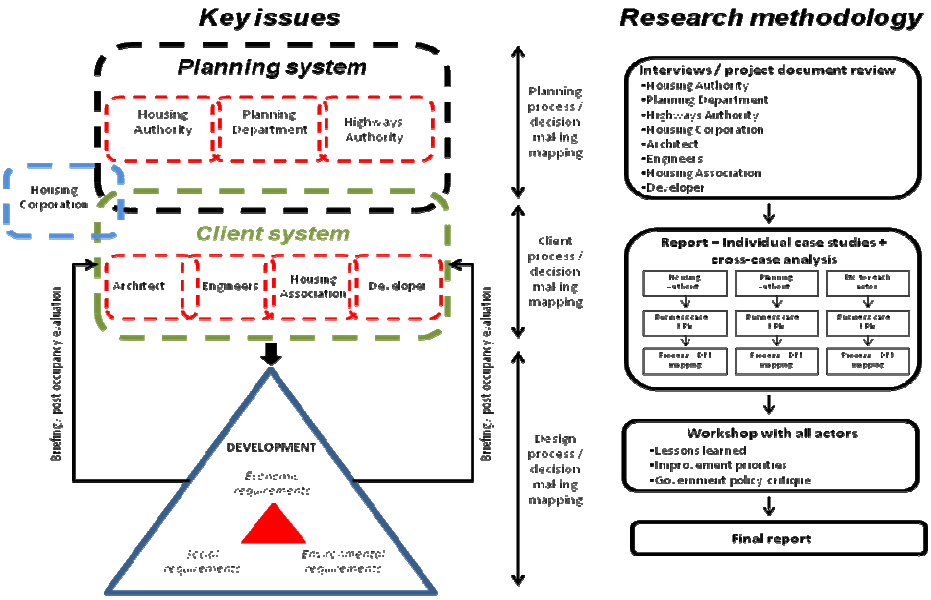

Figure 3. Case study - key issues and research methodology.

7 Conclusion and Further Research

This paper has outlined the innovation gap implied for the house building industry by the Code for Sustainable Homes. It proposed a model to show the project-based organisational factors of innovation and introduced an ongoing case study that will include the use of the model to diagnose the innovation challenges in the construction of housing to CfSH4. The case study research findings and conclusions will be reported in a paper and presentation to the 2010 International Post Graduate Conference.

8 Acknowledgement

We acknowledge that the PhD research for the project described is funded by the EPSRC (Engineering and Physical Sciences Research Council) under the DTA (Doctoral Training Account) scheme..

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Disaster Risk Reduction and Sustainable Development: Exploring the Relationships

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Abstract:
Statistical records on the frequency of disasters indicate that the number of disasters have increased in the recent past significantly, causing massive disruptions to the society. The substantial losses to human, material and environmental components of the world made by disasters have highlighted the need to reduce the risks of disasters. Disaster risk reduction could be addressed through minimising disaster vulnerabilities- the conditions which limit a society's responding capacity to a hazard. As these conditions are determined by factors or processes such as physical, social, economic, and environmental in a society, attempts for disaster risk reduction have strong links with the broader context of sustainable development in achieving environmental protection, social equity and economic growth. In this context, this paper explores the links between disaster risk reduction and sustainable development through a detailed literature synthesis. The paper also elaborates the relationship between disaster risk reduction and sustainable development by identifying the analogous ambitions of these two by highlighting the global agendas which incorporates this relationship.

Keywords:
Disaster risk reduction, Disaster vulnerabilities, Sustainable development

1 Introduction

Disasters are commonly known as sudden events, which bring serious disruptions to society with massive human, material and environmental losses, which exceed the ability of the affected society to cope using its own resources (Kelman and Pooley, 2004; Shaluf and Ahmadun, 2006). Apropos, statistics indicate a significant increase in the frequency and cost of disasters during the recent few decades. The total number of disasters in the world excluding some human induced disasters like war was 350 in 1950-1959 and has increased up to 4850 during 2000-2005 (EM-DAT cited Eshghi and Larson, 2008). As El-Masri and Tipple (2002) point out, the horrific images of recent disasters demonstrate the importance of shifting from post-disaster emergency actions to pre-disaster mitigation.

Improper development activities that accumulate risk to hazards have been shown as the major reason for the increasing losses from disasters (UNDP, 2004; UN/ISDR, 2003; Bendimerad, ca2003). As Bendimerad (ca2003) illustrates, disasters are directly correlated with development that increases vulnerability to natural and manmade hazards. Improper development positively impacts the frequency and severity of disasters, exposing a growing proportion of the world's population to hazards (Bendimerad, ca2003).

However, a report by UNDP (2004) illustrates natural disasters not only as the product of failed development but as a cause for such development as well. According to UN/ISDR (2003), during the past four decades, natural hazards have caused major loss of human lives and livelihoods, the destruction of economic and social infrastructure, as well as environmental damage. As disasters damage infrastructure, lifelines and critical facilities, resulting in human, financial and environmental losses, rehabilitation requires funding, often resulting in the diversion of funds originally planned for development and service provision (Bendimerad, ca2003). It has been indicated that the average global economic cost of disasters has increased approximately six-fold from 1970 to 2000 (Munich Re, 2001 cited Bendimerad, ca2003). The significant amount of resources which is absorbed for disaster response and humanitarian assistance that could instead allocate for development efforts has informed the world that it needs a sustained and comprehensive disaster reduction strategy.

Accordingly, this paper aims at establishing the close relationship between disaster reduction and sustainable development through identifying the links in between them based on a literature review. The following section provides a basis to achieve this aim, explaining how the disaster risk reduction can be achieved through minimising disaster vulnerabilities while introducing the links between disaster vulnerabilities and the susceptibilities created through poor development activities. The third section of the paper gives a detailed account of how sustainable development activities and disaster risk reduction are linked with each other followed by a section which highlights the key global initiatives and measures for integrating disaster risk reduction with sustainable development.

2 Achieving disaster risk reduction through minimising vulnerabilities

How a disaster occurs is important in understanding the ways of reducing it. As literature exhibits, any disaster emerges as a combination of a triggering agent (hazard) and vulnerabilities (McEntire, 2001; Sahni and Ariyabandu, 2003). A triggering agent or hazard is defined as a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (UN/ISDR, 2004). Further, as UN/ISDR (2004) describes, hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) or induced by human processes (environmental degradation and technological hazards). On the other hand, vulnerability is known as a set of conditions that affect the ability of countries, communities and individuals to prevent, mitigate, prepare for and respond to triggering agents (Ariyabandu and Wickramasinghe, 1997). McEntire (2001) shows that

vulnerability acts as the dependant component of a disaster while the triggering agent stands as the independent component. Therefore, vulnerabilities the conditions which affect the capacity of a society in responding to a triggering agent are the controllable component of a disaster.

UN/ISDR (2004) defines disaster vulnerability as the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. This definition is further elaborated by the Working Group on climate change and disaster risk reduction of the United Nations Inter Agency Task Force for Disaster Reduction (IATF/DR-UN) (2006) by identifying different categories of vulnerabilities and their components as follows:

Physical vulnerability- susceptibilities of the built environment and may be described as "exposure"

Social factors of vulnerability- levels of literacy and education, health infrastructure, the existence of peace and security, access to basic human rights, systems of good governance, social equity, traditional values, customs and ideological beliefs and overall collective organizational systems

Economic vulnerability- characterises people less privileged in class or caste, ethnic minorities, the very young and old, the disadvantaged, and often women who are primarily responsible for providing essential shelter and basic needs

Environmental vulnerability- the extent of natural resource degradation.

The above definition and categorisation express the close relationship between disaster reduction and sustainable development since the latter three categories are directly interrelated with the sustainable development goals of social equity, economic growth and environmental protection. Although there is no direct interrelationship evident with the first category, reducing susceptibilities of the built environment contributes to all three sustainable development goals as all the other vulnerability factors are linked with the products of the built environment and the way they are produced.

On the other hand, McEntire (2001) classifies the variables which interact to increase disaster vulnerabilities under physical, social, cultural, political, economic, and technological headings as listed below:

- **Physical**
  - the proximity of people and property to triggering agents
  - improper construction of buildings
  - inadequate foresight relating to the infrastructure
  - degradation of the environment.
- **Social**
  - limited education (including insufficient knowledge about disasters)
  - inadequate routine and emergency healthcare
  - massive and unplanned migration to urban areas
  - marginalization of specific groups and individuals

- **Cultural**
  - public apathy towards disaster
  - defiance of safety precautions and regulations
  - loss of traditional coping measures
  - dependency and an absence of personal responsibility
- **Political**
  - minimal support for disaster programmes among elected officials
  - inability to enforce or encourage steps for mitigation
  - over-centralization of decision making
  - isolated or weak disaster related institutions
- **Economic**
  - growing divergence in the distribution of wealth
  - the pursuit of profit with little regard for consequences
  - failure to purchase insurance
  - sparse resources for disaster prevention, planning and management
- **Technological**
  - lack of structural mitigation devices
  - over-reliance upon or ineffective warning systems
  - carelessness in industrial production
  - lack of foresight regarding computer equipment/programmes

Therefore, the above list of factors must be reduced in order to achieve disaster reduction through decreasing disaster vulnerabilities. This list confirms the links between development activities disaster vulnerabilities since many of these factors are involved in development activities. This emphasises that vulnerability is largely dependent on development practices that do not take into account the susceptibility to natural hazards (UN/ISDR, 2003).

However, according to the factors given in both of the above classifications, it is clear that disaster reduction is a long term process, since reducing disaster vulnerabilities or the factors which facilitate them is not an easy task which can be achieved within a short duration of time. The next section of this paper discusses the impact of disasters towards development while exploring the links between disaster risk reduction and sustainable development.

3 Disaster risk reduction and sustainable development

3.1 Disasters: a barrier for development

The escalation of severe disaster events triggered by natural hazards and related technological and environmental disasters is increasingly threatening both sustainable development and poverty-reduction initiatives (UN/ISDR, 2003). The impact of disasters have long lasting implications for national development as they can shatter development efforts and drain economic resources of the community they affect through exacerbating poverty, disrupting small business and industry activities, and disabling lifelines vital for economic activity and service delivery (Boulle *et al.*, 1997). Further, as Bendimerad (ca2003) illustrates disasters delay development programs by reducing available assets and interrupting planning. Disasters also reduce human capital as a

result of the deaths, injuries and long-term trauma suffered by affected individuals (Bendimerad, ca2003).

3.2 Disasters: a result of poor quality development

El-Masri and Tipple (2002) state that disasters must be considered as unresolved development problems and that they are not unpredictable, isolated or independent events; Indeed they are 'failures in development'. Year after year, the world's exposure to natural hazards increases as a result of unsustainable development and following are the main factors which correlate disasters and development (Bendimerad, ca2003).

Poor land management
Increased population concentrations in hazard areas
Environmental mismanagement, resulting in environmental degradation
Lack of regulation and a lack of enforcement of regulation
Social destitution and social injustice
Unprepared populations and unprepared institutions
Inappropriate use of resources

Confirming that development efforts have a significant impact on disaster vulnerabilities it is generally agreed that natural disasters are becoming more severe and more frequent in the case of developing countries where there is an increase in human settlements in vulnerable areas, rather than a rise in the number of hazards (Deyle, 1998 cited El-Masri and Tipple, 2002). Rapid uncontrolled urbanization and precarious economic conditions are the two main reasons for the exacerbation of the effects of natural disasters in developing countries (El-Masri and Tipple, 2002).

3.3 Sustainable development towards disaster risk reduction

Sustainable development has been defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs by the World Commission on Environment and Development in 1983 (Anderson, 1995). Sustainable development activities which lead to economic growth, social equity and environmental protection have a major contribution to disaster risk reduction as both are aimed at vulnerability reduction (Stenchion, 1997). Hence, it is important to take measures for disaster risk reduction in all development activities as they can increase or/and decrease disaster vulnerability (United Nations, 1992 cited McEntire, 2004). Disaster and risk reduction is therefore emerging as an important requisite for sustainable development (UN/ISDR, 2003).

Thus, disaster reduction incorporates taking measures in advance, addressing risk reduction, involving environmental protection, social equity and economic growth, the three cornerstones of sustainable development, to ensure that development efforts do not increase the vulnerability to hazards (UN/ISDR, 2002). In this context, disaster risk reduction (disaster reduction) has been defined by the United Nations International Strategy for Disaster Reduction (UN/ISDR) as the systematic development and application of policies, strategies and practices to minimise vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) adverse impact of hazards, within the broad context of sustainable

development (UN/ISDR, 2003). The disaster risk reduction framework introduced by the UN/ISDR is composed of,

Risk awareness and assessment, including hazard analysis and vulnerability/capacity analysis;
Knowledge development, including education, training, research and information;
Public commitment and institutional frameworks, including organizational, policy, legislation and community action;
Application of measures, including environmental management, land use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments; and
Early warning systems, including forecasting, dissemination of warnings, preparedness measures and reaction capacities.

Similarly, according to Bendimerad (ca2003) there are four parallel and complementary lines of actions which can be considered to reduce exposure to disasters and achieve a more sustainable approach to development as:

Community/stakeholder participation
Public policy actions
Safer construction and urban development
Development of a culture of prevention

However, the impacts of development towards the natural environment have a vital role to play in achieving disaster reduction through sustainable development. In this context, UN/ISDR (2003) exhibits, the desire for quick economic returns and increasing deregulation as leading factors to increased vulnerability to disasters which encourage unregulated construction, the inappropriate siting of important facilities, deforestation and the destabilizing of slopes for potential landslides. Therefore, sustainable and integrated management of natural resources, including reforestation schemes, proper land use and good management of rivers and coastal areas, will increase the resilience of communities to disasters by reversing current trends of environmental degradation (UN/ISDR, 2003). As UNDP (2004) emphasises, although that disaster risk is not inevitable, it can be managed and reduced through appropriate development policy and action. Apropos, as the above facts illustrate disaster reduction policies and measures need to be implemented to build disaster resilient societies and communities, with a two-fold aim (UN/ISDR, 2003); to reduce the level of risk in societies, while ensuring, on the other hand, that development efforts do not increase the vulnerability to hazards but instead consciously reduce such vulnerability. Accordingly the succeeding section highlights the key global initiatives towards integrating disaster risk into development activities.

4 Global awareness on the relationship between disaster risk reduction and sustainable development

In September 2000, the United Nations General Assembly adopted some specific tasks to be achieved by 2015 as Millennium Development Goals (MDGs) in the areas of poverty, education, gender equality, child morality, maternal health, HIV/AIDS,

environment and development cooperation and it has been identified that disaster risk reduction has a significant role to play in the MDGs as meeting the MDGs is extremely challenged in many communities and countries by losses from disasters (UNDP, 2004). On the other hand, UNDP (2004) shows how appropriate development policies can reduce disaster risk while facilitating the achievement of MDGs by reducing losses and protecting existing development gains as well as avoiding the generation of new risk. Thus, MDGs could be introduced as a major agenda which highlights the importance of achieving sustainability in development work through integrating disaster risk reduction to development goals.

In a globalising world, risk reduction is an essential element in building competitiveness and a basis for sustainable development as sustainable development is not possible without addressing vulnerability to hazards (UN/ISDR, 2003). As UN/ISDR (2003) describes, based on the International Decade for Natural Disaster Reduction (1990-1999) and the Action Plan adopted at the First World Conference on Natural Disaster Reduction held in Yokohama in 1994, the World Summit on Sustainable Development (WSSD) in 2002 provided the opportunity for the conceptual integration of disaster reduction within the agenda of sustainable development. Disaster risk reduction was an emerging issue taken into consideration during the preparatory phase of WSSD as losses from disasters caused by natural hazards will continue to increase unless there is a shift towards proactive solutions (UN/ISDR, 2003).

Further, emphasising the necessity of integrating disaster risk reduction into all development activities, Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, the framework adopted in the world conference in disaster reduction in 2005 states that, "*the efforts to reduce disaster risks must be systematically integrated into policies, plans and programmes for sustainable development and poverty reduction, and supported through bilateral, regional and international cooperation, including partnerships.*" (UN/ISDR, 2005). Thus, the global awareness of integrating disaster risk reduction into development activities has been increased by publicising its importance.

5 Conclusion

The significant amount of human, environmental and economic losses from disasters have informed the world that it needs to shift from post disaster responsiveness to a culture of prevention. Disaster reduction can not be addressed without referring to the development activities of the world since development could regulate the level of disaster vulnerability. The link in between disaster risk and development is extremely strong as disasters can be both a cause and product of improper development. Therefore sustainable development which does not increase the susceptibilities of the world to disasters is vital in achieving disaster reduction.

Sustainable development and disaster risk reduction are need to be considered as parallel interlinked issues which have a common goal since both of them are aimed at vulnerability reduction. Awareness on the close relationship in between them should be raised to avoid considering the issues separately which ultimately will lead the world to face increased vulnerabilities.

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Promoting Sustainable Tourism through Landscape Architecture in Developing Countries: Case Study of Nigeria

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Abstract:
The benefits associated with recreation and tourism is widely acknowledged, which is especially the case when the effects on stress and the enhancing impact on well-being and productivity are considered. This is why society strives to facilitate places of recreation and tourism, some of which are natural and others man-made features commonly referred to as landscapes. Landscaping is generally used to engineer and boost tourism by many countries, as it adds to the natural beauty and scenery of the physical environment. However, tourism and recreation are often underdeveloped in many developing countries, particularly sub-Saharan Africa despite being endowed with rich natural and scenic landscapes. The paper reports findings from an on-going research on developing sustainable landscape and tourism in Nigeria. The research methodology employed in this study included relevant literature search, oral interviews and visits to selected tourist attractions and urban centers in Nigeria to ascertain the level of landscape development and attendant tourist infrastructures. The paper discusses the importance and value of landscape as a tourist attraction in the urban environment, and recommends ways in which landscaping can enhance the urban physical environment and boost tourism.

Keywords:
Developing, environment, landscape, tourism, urban

1 Introduction

Tourism and Recreation are interwoven in that both help reduce stress, improve productivity and renew the mental and psychological state of the mind. The activities which lead to the ease of mental stress and improve quality of life are usually carried out outside the normal working hours either within the individual's environment or outside their places of abode. Landscape plays an important role in facilitating leisure and recreational activities, which crucially depends on nature and the systematic arrangements of land features. As Eckbo (1964) rightly describes, landscape is the art of design, planning, and management of land and this involves the arrangement of natural and man-made elements underpinned by cultural and scientific knowledge albeit with

concerns for resource conservation and stewardship. Thus, landscapes often produce useful and healthy physical environments that enhance quality of life (Hanna and Cousins, 2001).

The definition of Landscape as defined by Aben and Wit (1999) to mean the physical visual dimension of the built and un-built surface of the earth with the distinctions to be made there in between natural, cultivated and urban landscape will be adopted in the context of this paper. Also Jakle (1987) said that landscape include the visual elements one might see, be it rural or urban. Meaning all that can be seen or scenery of natural and man-made features that can be perceived in a single view. Landscape evolved as a result of the unavoidable interaction between man and his environment. There is always an element of landscape around us planned or unplanned, which indicates that landscape can either be natural or man-made and both can be used effectively to promote tourism and enhance recreational activities. Good landscape combines various elements such as plants, building, ponds or lakes in an aesthetically pleasing way (Redmond 2008).Landscape features such as the hills, water bodies, mountains and valleys can be used to promote tourism and recreational interests in particular locations.

Tourism generates wealth and employment and it is a major source of income for countries with developed tourism and recreational infrastructure and services. This is associated with lots of opportunities that come with tourist activities. The main economic impacts as identified by Lickorish and Jenkins (1997) relate to foreign exchange earnings, contributions to government revenues, generation of employment, income and stimulation to regional development. Tourism is a system incorporating not only businesses but also societies and Environment (Holden 2000).Tourism is still largely undeveloped in most developing countries like Nigeria, which is compounded by inadequate infrastructures for tourism, including tourist centers. Where such infrastructures may exist, they are ill maintained and dilapidated, and this has not really helped the development of tourism in Nigeria. In 1990, the Nigerian Tourism policy was introduced; the policy was to generate foreign exchange, encourage even development, promote tourism base rural enterprises, generate employment and accelerate rural urban integration and cultural exchange. (Online Nigeria portal 2008) However, till date, most tourist centres are yet to experience the changes meant to bring about the implementation of these policies. The level of infrastructure has not changed for the better, very few private partnership in tourism exist leaving so many of its tourism potentials untapped and undiscovered.

Additionally, population explosion in the urban centres, the quest to own a space no matter how small for commercial activities, ignorance and general reluctance of beautification has deprived Nigerian cities the beauty often associated with landscaping. Landscape reveals the beauty of a place. It provides an opportunity for a distinctive aesthetic experience (Berleant 2004).The memory of any tourist attraction starts with the landscape, depicting all the elements arranged in a systematic manner. For a properly planned tourist sites, landscape elements such as open lawns, fountains, sit-out, green areas and parking spaces are integral parts that motivate the growth of tourist businesses that often have beneficial multiplier effects on the rest of the economy. Some satisfaction derived from recreation includes adventure, fulfillment, physical well-being, emotional experience, enjoyment of aesthetics, and relaxation. This shows the likely importance of landscape to the physical well-being of the society.

Morris (2003) said that visual contact with nature was beneficial to the emotional, psychological health of a city dweller and has a restorative effect on the individual. Landscape encourages people to relax at leisure time, therefore, trees and shrubs are often planted to enhance people's relaxation, man-made elements such as outdoor seating, night light and fountain creates a scenic beauty that enhances recreation and the attendant benefits to households and tourists. This is particularly the case with pensioners who have much time on their hands, which is especially the case since landscape can provide numerous recreational opportunities for old people and the physically challenged. This is because parks and recreational centers are often characterized by various inviting landscape elements to which people are often drawn for relaxation.

2 Value and Importance of Landscape to Tourism

There are several reasons why people are involved in landscaping; to be outdoor, to be around beautiful things, to relax and escape from pressure of everyday life or to stay active and get exercise (Reif, 2001). In other words, landscape plays vital roles in the day to day life apart from adding to the quality of life and environment; it is also useful to many other facets life. Accordingly, the immense contribution of landscape to the environment, economic development, human health and the future has been summarized by Reif (2001), as follows:

Enhancing the Environment: in tourist centres Plants help to protect water runoff, nitrate leaching from the soil and other pollutants. Plants also help reduce soil erosion when they are densely planted and also reduce flood. Plant reduces temperature through shades provided by trees. Plants also screen busy streets, reduce noise and glare from head lights. Value as supported by the Scottish Landscape Forum(2006) include having a pleasant surrounding and amenity, it gives a regional distinctiveness, gives local identity and a sense of place and adds to scenic quality of our environment.

Promotes Economic Development: Attractive landscape increases the value of a tourist centre, increases community appeal, it reduces crime through well planned and maintained landscapes and increases tourism revenue. Apart from these as supported by Mooler et al (2004) is the use of trees for many Architectural, Engineering, Climatic and aesthetic purposes. Its view increase job satisfactions as employees with an outside view of plant experience less job pressure, it increases community pride and positive perception of an area.

Improves Human Health: A well landscaped tourist centre offer an environment for people who are sick, injured or under stress to recover. Such places also serve as a therapy; as working around plants improves quality of life through psychological and physical changes. According to Hickman (2006), Landscape has a therapeutic importance as it gives the patient an opportunity to exercise in the open air and help promote cheerfulness and happiness. Fresh and healthy food got from the garden produces vitamins and minerals and also aid excellent physical exercise through weeding, mowing and other forms of care.

Landscaping for the Future: In keeping our communities, we have to take responsibility of our environment as landscape is an integral part of our culture and plays an essential role in the quality of the environment, affecting our economic well-being and the physical and psychological health of man. Sustainable landscape maintenance techniques can be used to protect the environment while enhancing economic development and improving workers productivity.

Landscape is a dominant attraction in tourism, outdoor recreation and leisure (Lengkeek, 2007).Tourism involves travelling outside ones immediate surroundings to another place either for weekend or holiday visit for a time frame not more than 12 months. In carrying out this task, money and time are involved and the tourists before a choice of destination, is sure that the facilities, infrastructure, amenities and environment are better than where he or she is setting out from as tourist want to have a change of environment for the purpose of new experience. Some importance of landscape to tourism includes the creation of increased attraction to a particular area, (Wedde, 2006) noted that looking at wonderful views can be inspiring, Increased level of income generated to the country and locality. It serves as a therapy for the sick and an avenue for tourist to learn and see the nature in its natural beauty, and this is often complemented by well planned environment with good landscaping materials.

On the other hand recreation is an arm of tourism which involves the leisure activity of the tourist, and this can be significantly influenced by landscaping. The aim of recreation is to refresh, recreate and relax the body and mind, this therefore means that landscape will be of utmost importance to achieve these and recreation is more of the environment in which the activity takes place than the activity itself. To bring the spirit soul and body together, a quality and severe environment is important.

3 Impact of Landscape on Tourism in Nigeria

Tourism in Nigeria is still being discovered and packaged, but this cannot be complete without putting landscape as a major focus at the design stage. Tourist visit and arrivals is very much on the low side. In 2004 according to Encarta Encyclopedia, only 96200 tourists visited Nigeria and most of them were from neighbouring countries. For instance, in 2005 as also recorded by Encarta (2008), France recorded a total of 79.5million tourists and a receipt of 6.6 billion dollars, also the United States records 65million tourists yearly and an average receipt of 12 billion dollars in 2005. It must be emphasized that the tourism potentials in Nigeria have not been properly explored and packaged. A lot can be achieved if landscaping can be applied to further attract tourists to these sites.

Potentials such as palaces, tombs, caves, waterfall lakes, rocks, hills, festivals to mention a few can be turned into popular tourists destination if the sites are complemented with landscape elements such as lawns, sit outs, walkways and gardens. This will help create a lasting impression on the minds of the visitors.

In terms of accommodation, landscape and beautiful resorts and hotels can be built close to the attractions to provide a comfortable and conducive shelter for the tourists.

Conducive environments also contribute to the pleasure and night atmosphere for every tourist.

4 Level of Landscape Development in Selected Tourist Centres in Southwest and North Central Nigeria

Six tourist sites were selected and visited from the southwest and north central Nigeria, to determine the level and extent of landscape in them. These are summarized briefly below.

Ebomi Lake: The Lake is located at Ipesi in Akoko south local government area of Ondo state. It is a mysterious lake, believed to have spiritual and guiding power, with power to cure sickness and all forms of barrenness. Ebomi lake is 1.6kilometer in length, 40 meters in width and bottomless. It was made a tourist centre by some Europeans years ago, where they built structures for tourist use. At present those structures are dilapidated due to lack of maintenance, they have been turned into a breeding ground for Ebomi fowls, The Lake is also being used by fishermen for fishing and also by farmers for irrigation purposes. There are no landscape features apart from trees around the lake. The government has only identified the lake as a tourist centre but it has not been developed. The buildings can be renovated as a step towards development, lake maintained and the surrounding landscape.

Olumo Rock: Olumo rock is situated in Abeokuta, Ogun state. The town is amidst a group of rocks with the famous Olumo rock at the centre. The rock was believed to have served as security during war for the Egba settlers. In the past, the only forms of landscape were trees and grass which surrounded the rock and steps which lead to the top of the rock from where the extent of the town can be viewed. It was recently redeveloped by the state government in 2003 with additional facilities such as lifts, museum multipurpose hall, eateries, fountain, and few landscape features added and visited daily by different tourists. It is being managed and maintained by funds generated from the gate fee.

Takwa Bay: This is a coastal region located on an island in Iru in Lagos state. It has a population of about 50,000 people and was established in 1956 by a family called "Onisiwo". It is about 15 minutes by boat from Victoria Island in Lagos. In the past, the island served as store houses and chalet for some companies but was later converted to a beach resort. The area is generally sandy with few shrubs and a lot of coconut trees, with activities such as swimming, beach soccer and boat racing taking place daily by visitor. The few landscape features such as stones, trees, few plants, bamboo are not organized and are maintained by individual owners. Water erosion poses a major problem, lack of basic infrastructure and lack of knowledge about landscape.

Confluence Beach Resort Lokoja: It is strategically located where the meeting point of rivers Niger and Benue can be seen. It is relatively new, about seven years old. It was established by the Kogi state government and managed by a private firm. The resort is well landscaped with features such as Tree, grass, palms, kerbs, paved ways and water were used. At present there is adequate supply of water but not all the landscaped

feature are well maintained, the swimming pool is not maintained, part of the accommodation is being converted for other purposes

Millennium Pack Abuja: Millennium Park Abuja is located in the Federal Territory; the millennium park was built and donated to the federal government in 1999 by Stabilini Construction Company limited as a contribution to the growth and development of Nigeria. It was managed and maintained by the company for few years before being handed over. Being privately built, and maintained, it is well landscape with good vegetation and landscape features, good wad network for both vehicular and pedestrians; it has facilities to take care of hundreds of people, with high maintenance cost.

Kainji National Park: The game reserve was established in 1962. It is situated in Niger state with a total area of 5,340.82 square kilometer. It is a combination of the Borgu game reserve (3,970.02 square kilometer) and Zuguma game reserve (1,370.89 square kilometer). It was taken over by the federal government in 1978 and named Kainji National Park. The use of soft and hard landscaped had been in the park from inception with about 75% of green landscape. Various elements such as parking spaces drive ways demarcation of the different areas and positioning of the various structures well arranged. At present, these elements have deteriorated and the park has lost its value as weeds and over grown plants has taken over. The main problem facing the park is lack of maintenance of facilities.

5 Research Findings

The landscape features and the general facilities in the tourist centers visited were generally examined based on researchers observation using the following criteria; landscape availability, level of landscape maintenance, management of centers, publicity, enlightenment, nature of structures, availability of tour guides, rating each park either high, medium or low. These findings are summarized in the table below.

Tourist centre	Landscape availability	Level of landscape maintenance	Management of centre	Publicity	Enlightenment	Nature of structure	Availability of tour guides
Eboni lake	Low	Low	Low	Low	Low	Dilapidated low	Low
Olumo rock	Medium	Medium	Medium	Low	Low	New	Low
Takway bay	Low	Low	Low	Low	Low	Dilapidated	Low
Confluence beach resort	Medium	Medium	Medium	Low	Low	New	Low
Millennium park	High	Medium	Medium	Medium	Medium	New	Medium
Kainji national park	Low	Low	Low	Low	Low	Low	Low

Table 1: Landscape Development in Selected Tourist Centres.

Source: Researcher's Field survey 2008.

The problems in all the tourists centres visited are similar. The table above shows that landscape feature in most of the centre is either nonexistent, except for the trees and

shrubs around and where they exist they are very scanty, and are not maintained at all. For a tourist attraction to be inviting it has to have very rich landscape feature which will attract visitors. The management levels are also low, as this depends on availability of fund, with enough fund, more people would be employed. Some of the centres are not publicized by the government and the people in these areas are not enlightened about tourism, its benefits and the need for landscape. The structures in these centres are also dilapidated except for the relatively new and redeveloped centres. The tourist sites also lack tour guides, some of the centres had only one tour guide while some had none. This shows that the number of visitors recorded daily are very few. With development, this has to be increased, as more visitors would be recorded. The government can redevelop these sites through a well-planned landscape, involving experts in the field, publicizing the sites and enlightening the masses on the need for landscape, its importance and tourism in general. The following are the researchers recommendation on the sites visited.

At the Ebomi Lake, the villagers can be encouraged by creating a separate fishing pond for their economic activities thereby preserving the lake and a general landscape along the lake with sitting arrangements and walk paths.

Additional charges can be introduced at the Olumo rock for cars to generate more funds in other to improve upon the existing Landscape and its sustainability.

The government can come to the aid of the Takwa bay, enlightening the people, general development of the area and using landscape to check erosion.

Routine check at the confluence beach should constantly be carried out on the entire environment and maintained to avoid deterioration

The maintenance at the millennium park is very high, government need to develop proper management culture in other to sustain the park.

Kainji national park and improving on the maintenance and landscape will help revive the park.

6 Landscape Elements Which Can be Used to Enhance Tourism

Landscape elements are not put into proper use in most tourist centers, in some; they are very scanty while in others they are not in existence. To achieve a quality urban environment and promote tourism, the following are recommended landscape elements which should be put in place to enhance tourism and recreation.

Lighting: Electrical lighting help in tourist site illumination. Different methods may be used to enhance the night beauty of the tourist centres using different bulbs and designs to beautify the environment. The vehicular and pedestrian ways and gardens should be treated differently to give special effects.

Street Furniture: These include benches with or without backs, lamps, advertising kiosks, bus shelter. All these can be done with desirable materials such as wood,

concrete, stone or metals because of the tear and wear of the weather and strategically place to add to the beauty of the tourist centre.

Street Signs: these can also add to the attractions of a tourist centre these are direction signs, police and fire call boxes, bill boards, warning and informative signs (Purdy 1967).

Urban Sculpture: Sculptures give good effect to the quality of the environment. Fountains and sculptures should be placed at strategic points, they help indicate important directions, celebrate a citizen and offer the eye a point of reference.

Plant Materials: These are very important element of landscape design apart from the natural function they perform; they serve to create a naturally appealing and conducive environment. These plant materials include shrubs, trees, ground lover and flowers. Plant contribute to life in ways such as wind protection, erosion prevention, sun rays and heat prevention, control of environmental pollution, enhances aesthetics and aural values, planting for economic purposes and caring for outdoor spaces.

7 Recommendation

Neglect, unconsciousness, ignorance and poverty are some problems which most tourist centers face is Nigeria, there is need for public orientation and participation in the different activities to enhance aesthetics value and functionality of the tourist centers. For the sustainability of tourist centers in Nigeria through the use of landscape, the following are recommended.

Communities around parks should be enlightened and educated on the importance of park to the community and to Nigeria as a whole

Enough workers should be employed to manage the environment, maintain the landscape and incentive be given in other to arouse their interest in the work.

Government should encourage community participation in the development to improve the quality of life of the people.

Experts in all areas especially in landscape should be involved at the planning stage to avoid abandonment.

All facilities in all tourist centres should be upgraded to international standard and landscaped for better and attractive look

8 Conclusion

This paper has elaborated on the need for landscaping the physical urban environment in developing countries to enhance sustainable tourism. It is evident that without landscape, the benefit of tourism and recreation may not be fully realized. It is the belief of the authors that interest in tourism can be ignited through landscape.

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Identification of Strategies & Challenges of Decentralized Alternative Energy Source for Reduced CO2 Emissions in the Mercantile Sector

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Abstract:
An increased CO_2 (a Greenhouse Gas (GhG)) emission and its accumulation in the atmosphere is a major climatic concern, and creates an urgent need to control its rate of growth with the goal to reduce or reverse the growth. Reduction is being attempted at macro scales, large GhG producers but relatively small in numbers, at mezzo levels such as mercantile stores which are large in numbers and relatively large consumers in scale and at micro scales such as individual dwelling units which are very large in numbers but relatively small in a GhG producer scale. This research identifies the strategies and challenges of decentralized alternative energy source for reduced carbon emissions in mercantile (retail) sector at the mezzo level. We develop a theoretical model for decentralized alternative energy source considering a parking lot of a retail outlet. . This approach creates a hybrid system that bridges the current grid dependent system and a grid-independent (off grid, or net zero) goal. A proposed physical model, future work, should be able to test the assumptions and hypothesis of the theoretical model presented.

Keywords:
CO2 emissions, Energy Consumption, Mercantile Sector, Net metering, Renewable energy, Sustainable Development

1 Introduction

Governments and scientists have recently agreed that there is an urgent need to control atmospheric CO_2 emissions (Fernandez Solis, 2007a). The article by S. Pacala & R. Socolow on “Stabilization Wedges: Solving the Climate Problem for Next 50 years with current technologies” suggests some of the current options that can be scaled up in the reduction for CO_2 emissions. One of the 15 such options is achieved through more energy efficient buildings that can cut carbon by one fourth of the current level by 2054 (Pacala & Socolow, R., 2004). EIA’s International Energy Annual (EIA, 2007a) indicates that there is an increase in energy consumption in residential and commercial sectors every year till the year 2030 and there is no reason to believe that the trend will reverse unless draconian measures are implemented changing in the way society builds

and works. EIA's Annual Energy Outlook of US for the year 2008 suggests that energy consumption in commercial sector is growing at a rate of 1.29% per year, higher than residential and the interpretation of the data suggests that it will surpass residential by the year 2085 Refer Table 1.

Table 1 : Rate of Energy Consumption in Residential, Commercial and Industrial Sectors (EIA, 2007)

	Data as per AEO 2007, EIA			Derived Calculations	
SECTOR	**Energy Consumption in Quadrillion (Quad.) BTU**		**Energy Consumption in 24 Yrs. (Quad. BTU)**	**Avg. energy consumption per year**	**Percentage Increase per year**
	Yr. 2006	**Yr. 2030**			
Residential	10.8	12.9	2.1	0.09	0.74%
Commercial	8.3	11.3	3	0.12	1.29%
Industrial	25	27.7	2.7	0.11	0.43%
Number of days between 2006 and 2030			8766	Percentage Increase per year = ((Future Value / Present Value) ^ (1/number of years)) - 1	
Assuming 365 days per year. Number of years is			24.01		

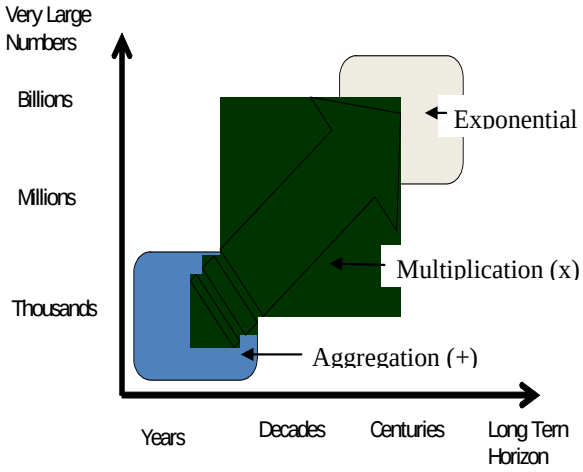

Figure 1: Scales of Number in a Time Line (Fernandez-Solis 2007)

EIA's latest report (CBECS, 2003) suggests that electricity consumption was the highest in Mercantile (Retail / Malls) followed by office buildings. John Lewis partnership, one of the leading retail giants in United Kingdom has targeted to reduce CO_2 emissions as a percentage of the sales by 10% by 2010 (against 2001/02 baseline). To reach such levels of sustainability (and energy efficiency) we need to identify and analyze various opportunities involved in delivering sustainability in the mercantile sector. These opportunities are at different scales. Large power plants are at macro scale but relatively few in numbers; Regional malls and Retail centers are at the mezzo scale and relatively large numbers; Dwelling units are at a relatively small scale but very large numbers, refer Figure 1. We argue that work to reduce energy consumption and emissions generation needs to be done at all scales. An increased CO_2, a Greenhouse Gas (GhG), emission and accumulation in the atmosphere is a major climatic concern, and creates an urgent need to control its rate of growth with the goal to reduce or reverse the growth.

2 Strategy for Emissions Reduction

The article by S. Pacala & R. Socolow on "Stabilization Wedges: Solving the Climate Problem for Next 50 years with current technologies" (Pacala & Socolow, 2004) is an important step towards this study. The article suggests stabilization and control of atmospheric CO_2 emissions in the first half of this century by scaling up current options available to produce at least one wedge (i.e. 1 giga ton carbon per year (GtC/year)). The options include Energy Efficiency & Conservation, Decarburization of Electricity & Fuels and Natural Sinks. Furthermore, Pacala and Socolow assert that more energy efficient buildings could reduce emissions from buildings by one-fourth by 2054. About half of potential savings are in the buildings in developing countries.

2.1 The Forces Behind the Problem

The projected growth in resource consumption and emissions generation in response to global population growth (on the short term horizon) and especially improving standards of living (on the long term horizon), point towards unsustainable future within the next 75 years (Fernandez-Solis, 2007b). In 1992 the National Academy of Sciences and the royal society of London issued a statement (Speth 2005). "*If population growth continues at currently predicted levels, much of the world will experience irreversible environmental degradation and continued poverty*". People overpopulation is defined as environmental worsening as there are too many people placing a demand on resources to meet basic needs (Fernández-Solís, 2008). The link between exploitation of resources, wealth and population is the subject of numerous studies. Ludwig et al (1993) observe that the history of resource exploitation is remarkably consistent: 'Resources are inevitably overexploited', often to the point of collapse or extinction. (Fernández-Solís, 2007a). Fernández-Solís (2008) proposed a framework of assumptions and facts suggesting that we had been assuming an unlimited supply of natural resources (for e.g. Fossil fuels), whereas limited flow of capital from artificial world, refer Figure 2.

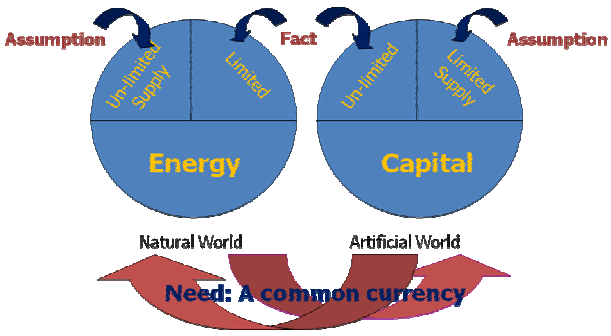

Figure 2: Need for a Common Currency (Fernández-Solís , 2008)

2.2 Energy Currency

Shann, (1983) argues that the energy currency is a concept used towards the creation of an energy economy. Energy as a currency in an energy economy works like local exchange trading systems that are local, non-profit exchange networks in which goods and services can be traded without the need for printed currency Energy as a currency in

an economy that has both renewable and non renewable energy achieves the goal of establishing as accounting system where trade-offs can take place (Appropedia, 2008) without the intermediary of money. The production of electrical energy has now become a basic activity for all modern communities that have made the financial cost of production relatively constant throughout the world. The technology of power production from renewable energy sources has diseconomies of scale and so favors small discrete autonomous communities. For this reason, the unit of electrical power, the kilowatt-hour (kWh) has much appeal as a universal unit of value for an autonomous community banking and monetary system. Shann, (1983) argues that the owners of the power generator would create a voucher or contract note to supply a specified number of kWh at a specified time in the future. The notes with a specified maturity date would represent the "primary" currency. According to Shann (1983) the renewable energy currency would be far more democratic than gold dollars, as sun, wind, and/or wave energy is available to all communities in the world, whereas gold is not and also, since each individual can own his own renewable electrical energy source to supply his own needs and/or to supply to others (Shann, 1983). The object of this energy currency approach is to incentivize those at the mezzo and micro levels to become producers of energy (hybrid or non-grid, self sufficient, non-zero). In order to understand an energy economy we first need to relate the cost of producing the gadget that produces energy from different sources.

2.3 Grid Parity

Grid parity means that the cost of producing solar energy will be comparable to obtaining electricity from fossil fuels. (FT, 2008). It is being achieved first in areas with abundant sun and high costs for electricity such as in California. (BP Solar, 2008). General Electric predicts grid parity without subsidies in sunny parts of the United States by around 2015. Other companies predict an earlier date. (Reuters, 2007). Tom Werner, chief executive of SunPower Corp, the largest North American solar company by sales, sees such "grid parity" for solar power in the United States and elsewhere happening in about five years, or possibly as soon as 2010. (Reuters, 2008)

3 The Proposed System

Resource consumption and the delivery of energy have come a long way through various developments. Post-industrial revolution saw the increase in the consumption of natural resources and changed the pattern of human development. More centralized options were created for the delivery of energy to the industries and human habitat. The system of energy delivery moved from an independent system to the grid system. The consumption of natural resources increased as the industries increased and so the living standards improved which created a multiplying effect on the consumption of natural resources and it was not until 1970s that the effects of this development on environment were realized by many. The growth of energy consumption and delivery has seen three kinds of patterns, Independent (Yesteryears), Grid (Today) and Hybrid (Tomorrow). Net Zero (Off Grid & Independent) is the vision and need for the Near Future. As we realize that natural resources are not unlimited and if compared to the present rate of consumption, there is a need to develop a hybrid system, which supports the benefits of both independent and grid. Independent, at a small scale but with larger numbers makes

the system more sustainable and localized; whereas, Grid at large scale and small numbers creates economies of scale.

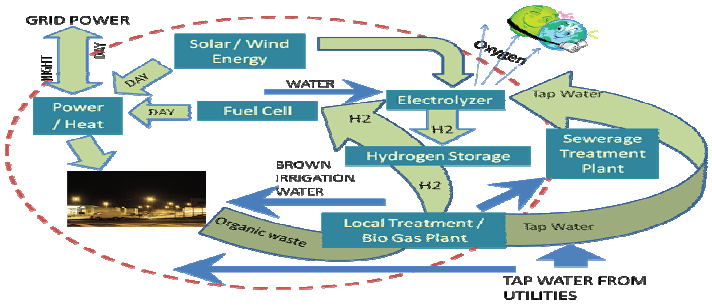

Figure 3: Proposed Decentralized Alternative Energy

It is proposed to develop a prototype hybrid model for a retail parking lot to observe the affects and identify strategies & challenges of decentralized alternative energy source for the mercantile sector, refer Figure 3. The system produces part of its energy demand out of its own resources; refer Figure 4, which will reduce the load on public utilities, thereby reducing the amount of carbon emissions too. Solar energy will be combined with the bio gas plant, which will treat waste to produce hydrogen through electrolysis. Excess Solar energy will be used for the electrolysis of water to produce and store hydrogen. The excess hydrogen produced will again be used to generate combined heat and electricity by hydrogen fuel cells. The heat produced is used for heating systems in the retail spaces such as washing, laundries etc. Further, this system when combined with bio gas plant, where the waste produced in the retail outlet could be processed to generate additional energy. Hydrogen will be stored in hydrogen tanks for use in peak seasons or it can even be sold to surrounding communities or the grid using net metering. The system will absorb solar energy during the day and store it in the form of hydrogen (which will be stored in hydrogen tanks) to produce electricity during the day time for the retail parking lot. The excess energy can be sold to grid using net metering or dual metering as required.

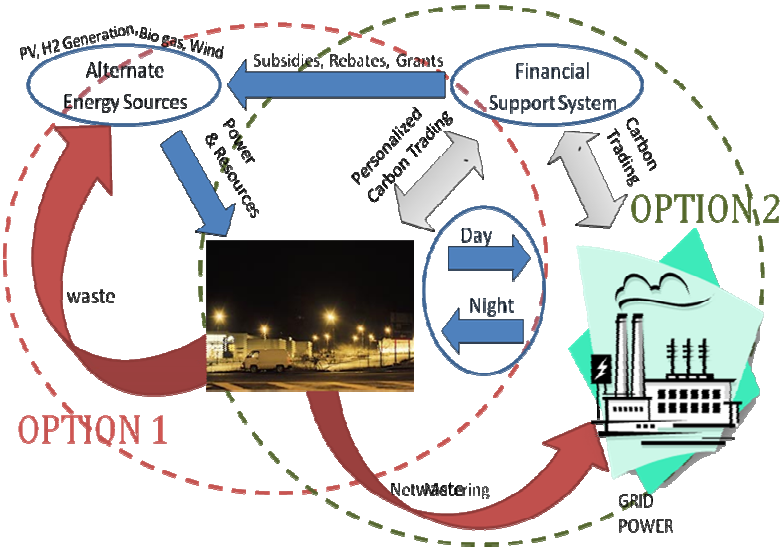

Figure 4: Proposed System Integration with the Grid

3.1 Theoretical Model

Parking lot lighting has been planned considering a virtual parking lot of 60 cars. Refer Figure 5. For deriving at the dimensions of the parking lot, Texas Accessibility standards (TAS, 1999) has been referred, whereas for lighting standards Illuminating engineering society of North Americas guidelines, Lighting for parking Facilities (IESNA, 1998) has been referred.

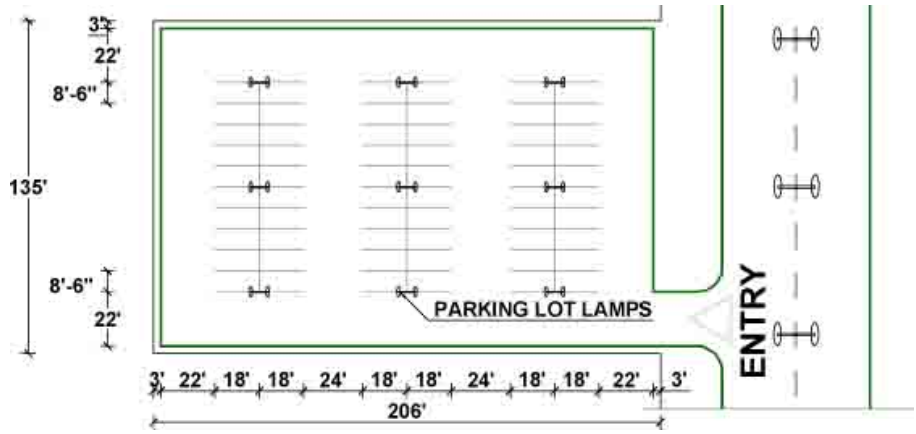

Figure 5: Typical Parking Lot design used for calculations

For minimum maintained foot candles (fc) at the parking lot from curb line to curb line IESNA RP-20-98 (refer Table 2 & 3) has been considered. Many retailers prefer even higher levels, with a specification of 1 fc as the minimum value as per IESNA RP-20-98**.** Therefore, for the calculations of the system design we consider 1fc as the minimum value of illuminance or light intensity. As per uniformity standard of 15:1 for enhanced security, the minimum to maximum range of lighting intensity will be in the range of 1 to 15 foot candles, as required by IESNA. Considering an average 7.5fc for calculations the lighting requirements of parking lot are as follows:

- Area of the virtual parking lot (Refer Fig. 8) = 206 X 135 feet = 27,810 sq ft.
- 1 Foot Candle = 1 Lumen per sq. feet (sq ft). Power required (Lumens) = 27,810sqftX7.5 fc = 208,575 Lumens
- For proper distribution we consider 20 lamps. Required Lumens (lm)/Lamp = 208,575 / 20 = 10, 428.75

Metal halide lamps available in market provide 60 to 200 lm/watt (W) power. Assuming 60lm/W of power we need 20 numbers of 174W Lamps. The closest available lamp in the market is 175 watt. The total power consumed by 20 lamps of 175W each would be 3.5kW and with 12 hours of running, the energy consumed will be 42kWh. Assuming additional 20% for lighting loads of security room, the net total energy consumption will be 50kWh.

3.1.1 Sources of Energy

There are three sources of energy being used by the system, i.e. Grid, Solar and Bio Gas. Excess energy from Solar and Bio Gas systems will be integrated to produce and store hydrogen

Solar System. 10kW and 50kW solar modules are considered for analysis. The total production of electricity is calculated as per PV Watts, a performance calculator for grid connected PV Systems, developed by National renewable energy laboratory, U.S.A (NREL USA, 2008). The City considered for calculations is Houston, Texas (Latitude / Longitude: 29.98° N / 95.37° W). The PV system module array type considered is Fixed Tilt.

Biogas Plant. Bio gas plant is considered for production of energy, using organic waste produced from the respective retail store. As per the data from the institute of local self reliance, 25 Shop Rite stores divert 3000 tons of organics per year, i.e. 0.33tons/store/day (ILSR, 1997). Dry material produces 465 m3 bio gas/ton. Some digesters even produce up to 20-800 m3 of bio gas per ton waste. (Zhang, El-Mashad et al., 2007). Considering 0.33 tons/store/day of waste, bio gas produced per day is 155 m3 approx. 0.6 m3 of biogas produces 1.0kWh of electricity (GEDA, 2008). Therefore, 155m3 biogas will produce 258kWh of energy per day. Consumption of energy by plant is 85kWh for 150 m3/day waste (Aoki, Umetsu et al, 2006). Net electricity produced by Bio gas plant (deducting energy consumption by plant)is 173kWh. Combination of biogas and solar energy will produce 206kWh and 340kWh of energy respectively for a 10kW and 50kW solar module. Deducting 50kWh energy consumed by parking lot lamps (refer section 3.1.1), the excess energy produced will be 156kWh and 290kWh (for 10kW and 50kW solar module). This excess energy will be stored in the form of hydrogen, which will be produced by electrolysis of available tap water. When required, the stored hydrogen will be used as a fuel for hydrogen fuel cell to produce electricity.

3.2 Financial Support Systems

The financial support systems can include Emissions Trading, Personal Carbon Trading, Net Metering and Renewable Energy Incentives by Federal and State Governments. Using these available financial support systems a financial model will be developed for validation in the physical model stage of this research. This includes:.

- Emissions Trading: Carbon Trading is a market based mechanism for helping mitigate the increase of CO2 emissions in the atmosphere. Carbon trading markets are developed that bring buyers and sellers of carbon credits together with standardized rules of trade (Carbon Trading, 2008).
- Personal Carbon Trading: As per Defra, in personal carbon trading, individuals would surrender their carbon credits upon the purchase of, for example, electricity, gas or transport fuel. Those who need or want to emit more than their allowance, would have to buy allowances from those who emit less. (Defra, 2008) The findings by Defra present a number of challenges to the personal carbon trading concept, but do indicate there may be circumstances in the future where personal carbon trading is a cost effective and desirable policy option. (Defra, 2008)
- Net Metering: As per the U.S. department of energy, net metering is a policy that allows homeowners to receive the full value of the electricity that their solar energy system produces. Under federal law, utilities must allow independent power producers to be interconnected with the utility grid, and utilities must purchase any excess electricity they generate. The excess electricity is then sold to the utility at

the retail rate (US DoE 2006). A number of studies have shown that net metering can benefit utilities including reductions in meter hardware and interconnection costs, as well as in meter reading and billing costs. (US DoE, 2006).

- Renewable Energy Incentives by Federal and State Governments: As per the database of state incentives for renewable energy (DSIRE), presently there are various rebate and grant program being provided in various states of united states, including tax credits like personal tax, corporate tax, sales tax, property tax, rebates, grants, loans, industry support programs, bonds and production incentives from both federal and state governments (DSIRE, 2008 and Golove, 2004). For an overview of the rebate programs refer.

Various available financial support systems has been analyzed above as part of literature review that helped in scenario planning for the development of the theoretical model of the proposed system.

4 Research Methodology

The study involved literature search and review. Literature review was done as part of iterative process of going back and forth as the project developed, refer Figure 12. Rolling wave planning (Rolling wave planning is the process of planning for a project in waves as the project becomes clearer and unfolds) has been adopted for the study. Literature review has been of help in defining the problem statement. The hypothesis was derived and through iterative process the problem definition was further refined. The research proposes to develop a theoretical technical and business model for the decentralized alternate energy source considering a parking lot. Various available financial support systems have been analyzed as part of literature review that helped in scenario planning for the development of the theoretical model of the proposed system. A physical model will later be developed as part of future work on successful acceptance of the theoretical model. The proposed physical model will include Engineering models, Cost and Financial Models, Value engineering and other concerned studies will be taken up during the development of physical models. Based on the finalized measurement tools, performance data and expectations data (of the user) will be collected, analyzed and interpreted. The study will give an in depth analysis of the strategies and challenges of the decentralized alternative energy source. The system will help in the reduction of CO_2 emissions in Mercantile Sector. A multiplying effect of this reduction will be analyzed on a global scale and the challenges involved would create further studies to be taken up.

5 Conclusion and Further Research

This paper develops a theoretical model and identifies strategies and challenges for decentralized alternative energy source for reduced carbon emissions in mercantile (retail) sector at the defined mezzo level. Various strategies in the developed theoretical model have been analyzed for decentralized alternative energy source, however there are various challenges involved in implementing this model. The challenges have been summarized as follows:

- Cost of alternative renewable energy sources need to reach grid parity.

- Hydrogen storage has to be made safer and cost effective and efficiency of various equipments like the electrolyzer, bio gas plant and solar panel need to be enhanced and made more cost efficient. Also, there production needs to be enhanced to reach economies of scale.
- Awareness of benefits for the acceptance of alternative renewable energy sources need to increased. Individual system size limit need to be increased in various states to make the systems more beneficial to the consumers and utilities. Although, 10 states (including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont) in United States have begun Carbon trading since September 2008 in power sector, it needs to be implemented on a large scale in other sectors too (WRI, 2008). There are number of challenges to the personal carbon trading in cost effective and desirable policy option (Defra, 2008).
- Although, under federal law, utilities must purchase any excess electricity they generate, some utilities are opposed to net metering because they believe it may have benefit utilities. There is an awareness required to be generated among utilities of the benefits of net metering (US DoE, 2006)

There have been various support systems that have already been developed or are in a developing stage in United States for the use of alternative renewable energy sources. However, there are still significant challenges involved in implementing decentralized alternative energy sources at a large scale in United States. Further research is required in areas like personal carbon trading. Although, there are technologies available, further research is also required to increase the efficiency of the available technologies to make them more cost efficient reach the Grid Parity. The theoretical model developed above will help in the development of the physical model. This physical model will later be developed as part of future work on successful acceptance of the theoretical model. The proposed physical model will include Engineering models, Cost and Financial Models, Value engineering and other concerned studies. Based on the finalized measurement tools, performance data and expectations data (of the user) will be collected, analyzed and interpreted. The study gives an in depth analysis of the strategies and challenges of the decentralized alternative energy source. A multiplying effect of CO_2 emissions reduction will be analyzed on a global scale and the challenges involved will create further studies to be taken up.

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BSRI (Building Sustainability Rating Index) for Building Construction

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Abstract:
The construction industry fulfills one of the most important basic human needs, enhancing quality of human life. Out of the total resources utilized worldwide, construction sector demands a considerable share of these resources ultimately producing major part of global CO_2 emissions. There is growing concern among all the parties involved in building construction about sustainability. There are several systems for assessment of building sustainability but there are very few systems assessing sustainability with resource consumption in mind. This research aims to deliver a building sustainability rating system which will assess sustainability with a perspective of resource consumption. BSRI will be easy to apply and will focus on macro as well as micro levels of building construction. Furthermore this system will be focused on owner's sustainability perspective. The criteria's and indices in BSRI will be well defined in order to reduce confusion and misunderstandings.

Keywords:
Building construction, Green Buildings, Sustainability Assessments, Weighted Point system, Resource consumption

1. Introduction

There is a growing concern among the stakeholders on how to improve construction practices to minimize their detrimental effects on the natural environment (Cole, 1999; Holmes and Hudson, 2000). The environmental impact of construction, green buildings, designing for recycling, waste reduction, dematerialization, de-construction and eco-labeling of building materials are some of the initiatives among other that have captured the attention of building professionals across the world (Johnson, 1993; Cole, 1998; Crawley and Aho, 1999; Rees, 1999).

Building performance, evidenced by the building commissioning movement is now a major concern of professionals in the building industry (Crawley and Aho, 1999) and environmental building performance assessment has emerged as one of the major issues in sustainable construction (Cole, 1998; Cooper, 1999; Holmes and Hudson, 2000). According to Cole (1998), the definition of building performance varies according to the different interest of parties involved in building development. For instance, a

building owner may wish his building to perform well from a financial point-of-view, whereas the occupants may be more concerned about indoor air quality, comfort, health and safety issues. Using a single method to assess a building's environmental performance and to satisfy all needs of users is no easy task.

Therefore, an ideal environmental building assessment will include a correct and complete set of requirements of the different parties involved in the development. The phrase built environment refers to the man-made surroundings that provide the setting for human activity, ranging from the large-scale civic surroundings to the personal places. The built environment has a profound impact on our natural environment, economy, health, and productivity. Green building has been defined as the practice of increasing the efficiency with which buildings use resources — energy, water, and materials — while reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal — the complete building life cycle.

Building designers and occupants have long been concerned about building performance (Cooper, 1999, Kohler, 1999, Finnveden and Moberg, 2005). Considerable work has gone into developing systems to measure a building's environmental performance over its life. They have been developed to evaluate how successful any development is with regards to balancing energy, environment and ecology, taking into account both the social and technology aspects of projects (Clements-Croome, 2004). Separate indicators, or benchmarks based on a single criterion, have been developed to monitor specific aspects of environmental building performance such as air quality and indoor comfort. However, these benchmarks serve to emphasis the need for a comprehensive assessment tool to provide a thorough evaluation of building performance against a broad spectrum of environmental criteria.

The Building Research Establishment Environmental Assessment Method (BREEAM) in 1990 was the first such comprehensive building performance assessment method. BREEAM was the first environmental building assessment method and it remains the most widely used (Larsson, 1998). The Building Research Establishment developed the system in 1990 in collaboration with private developers in the UK. It was launched as a credit award system for new office buildings. A certificate of the assessment result is awarded to the individual building based on a single rating scheme of fair, good, very good or excellent. The purpose of this system is to set a list of environmental criteria against which building performances are checked and evaluated. This assessment can be carried out as early as at the initial stages of a project. The results of the investigation can be fed into the design development stage of buildings and changes can be made accordingly to satisfy pre-designed criteria (Johnson, 1993). Since 1990, the BREEAM system has been constantly updated and extended to include assessment of such buildings as existing offices, supermarkets, new homes and light industrial buildings (Yates and Baldwin, 1994).

Crawley and Aho (1999) suggest that the system is successfully alerting building owners and professionals to the importance of environmental issues in construction. BREEAM has made an impact worldwide, with Canada, Australia, Hong Kong and other countries using the BREEAM methodology in developing their own

environmental building assessment methods. Following the launch of BREEAM in the UK many other assessment methods have been developed around the world to undertake environmental building assessment. Table 1 summarized the old and new environmental building assessment methods used in different countries.

Most of the environmental building assessment tools cover the building level and based on some form of life-cycle assessment database (Seo et al., 2006). There are two categories of tools that the industry uses: assessment and rating tools. Assessment tools provide qualitative performance indicators for design alternatives whilst rating tools determine the performance level of a building in a graphic (stars) or quantitative systems. Furthermore these tools are created and maintained by government or private agencies. EMGB, NABERS and BASIX are operated by the government while the others (such as LEED) have a private, voluntary and contractual origin and are guidance type only. They essentially aim at showing those involved in the building process the potential for improvement. Most building evaluation methods are concerned with a single criterion such as energy use, indoor comfort or air quality to indicate the overall performance of a building (Cooper, 1999; Kohler, 1999). As environmental issues become more urgent, more comprehensive building assessment methods are required to assess building performance across a broader range of environmental considerations.

An environmental building assessment method reflects the significance of the concept of sustainability in the context of building design and subsequent construction work on site. The primary role of an environmental building assessment method is to provide a comprehensive assessment of the environmental characteristics of a building (Cole, 1999) using a common and verifiable set of criteria and targets for building owners and designers to achieve higher environmental standards. It also enhances the environmental awareness of building practices and lays down the fundamental direction for the building industry to move towards environmental protection and achieving the goal of sustainability. It provides a way of structuring environmental information, an objective assessment of building performance, and a measure of progress towards sustainability.

According to US Environmental Protection Agency Sustainability means “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (USEPA, 2008) Sustainability requires that human activity only uses nature’s resources at a rate at which they can be replenished naturally. There is now clear evidence that humanity is living unsustainably by consuming the Earth’s limited natural resources more rapidly than they are being replaced by nature. During the ancient times, humanity used to construct their houses using natural resources without interfering with nature and finally giving back to the nature in the same format. Now days as technology advanced, we started to mutate natural resources to construct buildings which have resulted into a highly unsustainable grid pattern. This grid is causing serious harm to the concept of sustainability and needs to be changed in time in order to save resources for future generations.

Assessment Method	Origin	Characteristic	Reference
ABGR- Australian Building Greenhouse Rating	Australia Department of Commerce, NSW, 2005	Performance based ,Star rating on the scale of 1 to 5 Based on 12 months of energy consumption	Seo et al. (2006)
BASIX- Building and Sustainability Index	Department of Infrastructure, Planning and Natural Resources, 2004	Web-based planning tool for residential development To assess the water and energy efficiency of new residential developments NatHERS and AccuRate are simulation packages used to assess energy performance It is mandatory for all new residential development and a BASIX certificate is required for development approval	Seo et al. (2006)
BREEAM- BRE Environmental Assessment Method	United Kingdom, Building Research Establishment. (BRE)	First environmental assessment system used internationally Used four levels of ratings- excellent, very good, good and pass. Each criterion weighted based on its importance.	Shakoorian, A.
CASBEE- Comprehensive Assessment System for Building Environmental Efficiency	Japan, 2004 A co-operative project between industry and government	Applicable in accordance with the stages of a development in pre-design, new construction, existing building and renovation, t is based on the concept of closed ecosystems to determine the environmental capacities Consideration for regional character	Cole (2005), Yau et al. (2006), Seo et al. (2006)
GBTool - Green Building challenge	International, 1995, International collaboration of over 20 countries	The most comprehensive framework Absolute performance indicators to complement the relative scores More than 90 individual performance assessment Four levels of weighting can be used by different regions with the adjustment of regional variations	Cole (1998), Larsson (1998), Kohler (1999), Larsson and Cole (2001), Rohracher (2001), Todd et al. (2001), Yau et al. (2006), Seo et al. (2006), Shakoorian, A.
LEED- Leadership in Energy and Environmental Design	USA, 2000. Developed by the US Green Building Council	Self-assessing system awards rating of certified, silver, gold and platinum Use simple checklist format to rate building performance For new and existing commercial, institutional, high-rise residential & major renovation Comprises 5 areas of sustainability	Crawley and Aho (1999), Larsson (1999), Yau et al. (2006), Seo et al. (2006)
SPeAR- Sustainable Project Appraisal Routine	ARUP, Developed by private architectural firm, ARUP.	enable a rapid review of project sustainability Use a graphical format to present sustainable design	Clement-Croome (2004), Cole (2005), Yau et al. (2006)

Table 1: Summary of various sustainability assessment tools

2. Problem Statement

The purpose of this research is to develop a building sustainability rating index (BSRI).

3. Sub-problems

1. To categorize various types of buildings and identify critical processes for each project type.
2. To assess weighted score for the sustainability of each process.
3. To determine Sustainability index for respective category of the building.

4. Delimitations

1. The scope of this study is limited to building construction.
2. The scope of this research will limited to resource consumption.

5. Literature Review

Literature review indicates that the task of understanding and translating strategic sustainability objectives into concrete action at project level has become a very challenging task for construction professionals (Viitaniemi & Haapio, 2007). The process has been exacerbated by the multi-dimensional perspectives of sustainability such as economy, society, environment, combined with a lack of structured methodology and information at various levels. Also, while discussing environmental issues in the building sector, the use of terms is not well established. This inconsistent use of terms may cause confusions and misunderstandings (Viitaniemi & Haapio, 2007). Over the past few years, the increased concern over the deterioration of our environment has motivated the development of various sustainability assessment systems across the globe. Although most of them are based on the concept of life cycle assessment, they have been basically focused on the evaluation of the environmental performance during building operation (Cole, 2000). The limited attention given to the onsite construction impacts is a consequence of the perceived relatively lower significance of construction impacts compared with the lifecycle impacts associated with building design and management.

The environmental assessment methods all have limitations that may hamper their future usefulness and effectiveness (Ding & K.C., 2007).According to Ding (2007), current assessment methods do not adequately and readily consider environmental effects in a single tool and therefore do not assist in the overall assessment of sustainable development. Also the inflexibility, complexity and lack of consideration of weighing system are still major obstacles to the acceptance of sustainability assessment methods. Use of a sustainability index should simplify the measurement of sustainability and therefore should make a significant contribution to the identification of optimum design solutions and facility operations. (Ding & K.C., 2007)

According to United Nations World Commission on Environment and Development, Sustainability is which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs. (United Nations, 1987). Cole R. 2000, argues that the environmental building assessment methods contribute significantly to the understanding of the relationship between buildings and the environment. But the interaction withing the building and the grid still remains largely unknown.

In several countries “rating” schemes 2 have been introduced that do provide this additional information for assessing energy-efficiency compared to an arch-type building. These schemes have a variety of objectives forming either part of the requirements for building planning code compliance or part of a scheme to market energy-efficient environmentally responsible buildings (V.I. Soebarto, 2001). Despite claims to the contrary, most of these assessment programs are not design-orientated. They are constructed to give endorsement to a completed design rather than to assist the designer during the design process. (V.I. Soebarto, 2001)

Hence the in future the rating systems devevloped should ideally assist designers during the design process, they should be clear with the definitions of its indicators in order to avoid confusion, they should be developed with the help of trend analysis or equivalent to remove future uselessness.

6. Proposed Methodology

The objective of this research is to develop a rating system which will have an ability to satisfy present as well as future requirements of sustainability. The most significant problem facing everyone who attempts to study the future is how to sift effectively through the myriad of information sources and pull put those trends worthy of future study and tracking. Researchers use number of techniques to think about and sketch out future opportunities. Trend Analysis is one of those techniques used by researchers which give reliable outputs. Trend analysis is nothing but collecting and analyzing local, regional or global conditions. Researchers can develop forecasts of future conditions through simple exploration by collected data. (Wallace, 2005)

The proposed methodology for the development of BSRI consists of the following important concepts:

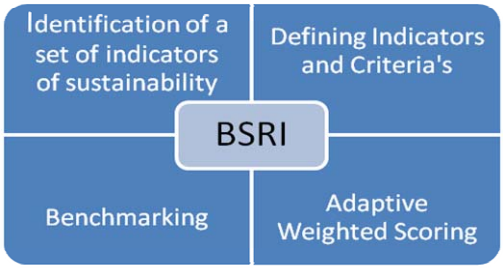

Figure 1: Important concepts in the methodology of BSRI

6.1 Indicators

An actor in the field of building construction needs tools and system to improve sustainability practices. These tools are based on Sustainability indicators and criteria's. According to Appu Haapio, 2007; indicators are measures which can show the direction of change while criteria are characteristics that are considered important and by which success or failure is judged.

Indicators provide crucial guidance for decision- making in a variety of ways. They can translate physical and social science knowledge into manageable units of information that can facilitate the decision- making process. They help to measure and calibrate progress towards sustainable development goals. They can provide an early warning, sounding the alarm in time to prevent economic, social and environmental damage.

One of the salient features of BSRI is it's easy to use index with well defined list of indicators. The BSRI research team will conduct a survey with a combination of structured interviews with industry professionals, academicians and policy makers in Green Building Industry. This process will help the team to establish clear set of definition with appropriate weights from professionals. Following chart shows some of the key sustainability indicators:

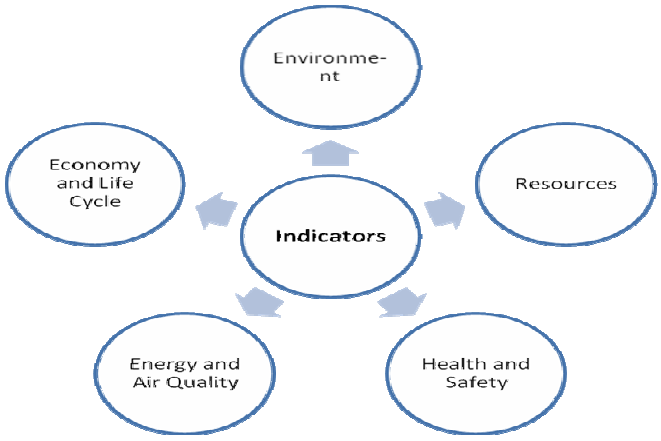

Figure 2: key sustainability indicators

6.2 Filters

Filter is a tool that is designed to pass certain criteria while blocking others. The filters in this research will be designed to remove various indicators that do not affect the resource consumption in the construction process.

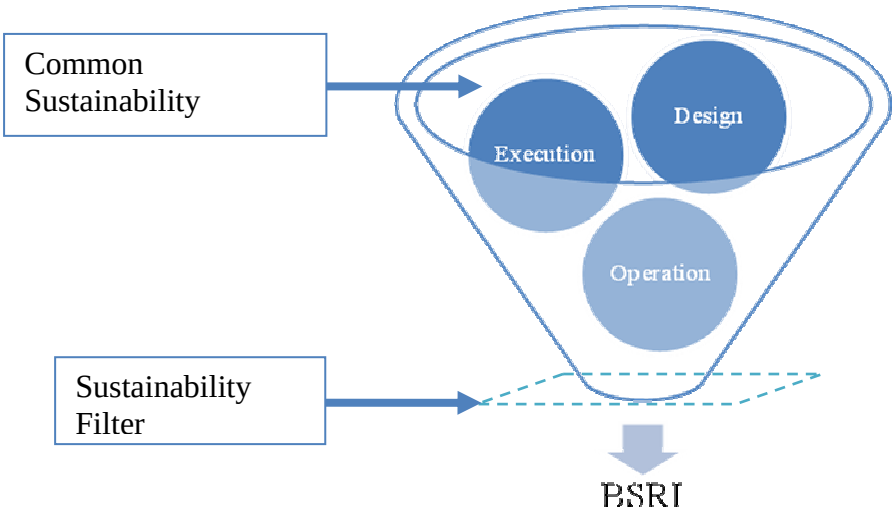

Figure 3: Sustainability filters

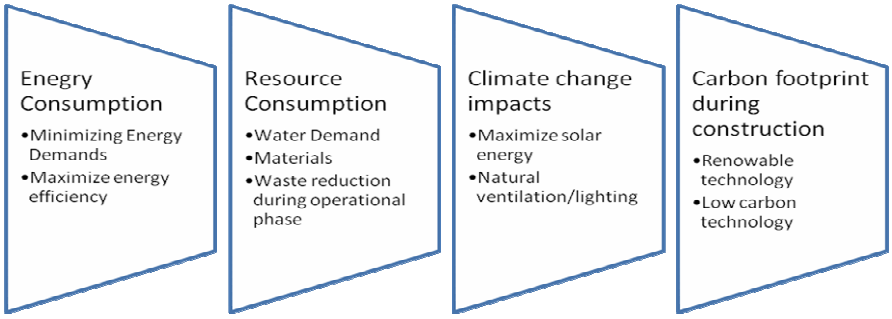

Figure 4: key sustainability indicators

After reviewing published literature and following above stated aspects, the research will move ahead with development of a matrix comprising of various activities that affects the sustainability of the buildings at the most (**Prototype**). This list will be then sent to various organizations such as owners, contractors, sustainability certifying professionals as well as to academicians for their review. They will be asked to rate each activity from 0-5 (0=doesn't affect sustainability, 5= affects sustainability the most)

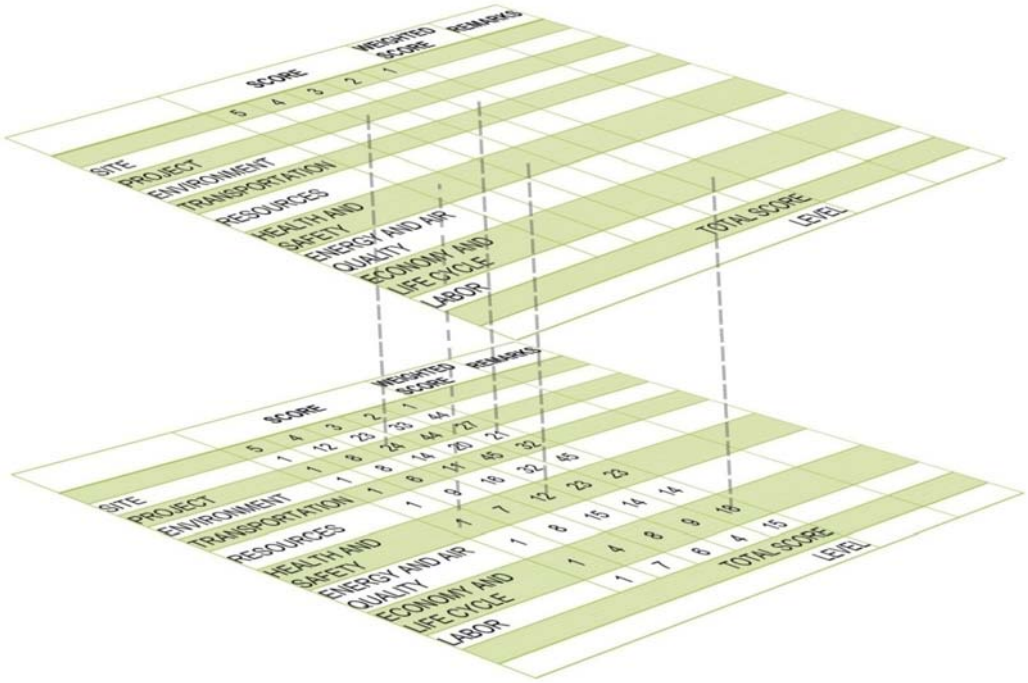

Figure 5: Graphical model of proposed rating system.

After receiving the reviews, next step in this research is to reorganize the matrix as per the review results and furnish it for the sustainability assessment stage.
In assessment stage, we will select 3 sets, each with 3 ongoing building construction projects for assessment purpose as follows –

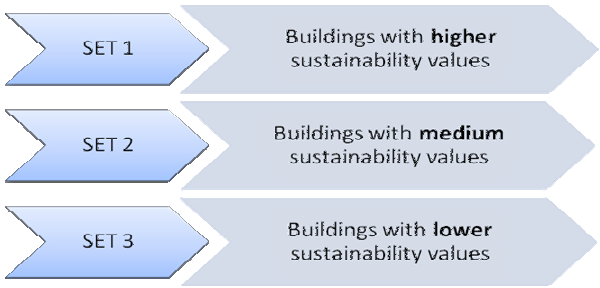

Figure 6: Project sets for BSRI

BSRI will be applied with these three sets and the results will be prepared for the next stage, which is the validation stage. Validation of the BSRI will be carried out through the workshops and surveys. In those, the BSRI results will be reviewed and analyzed by industry experts.

It is very important to set benchmarks during the development of any system. The benchmarks will be set for each activity with the evaluation of its impact on the buildings sustainability. Benchmarking will define limits for each level as well as it will give us the standard for the type of building. Following table shows conceptual project benchmarking for BSRI:

Project Benchmarking

SR NO.	PROJECT	TYPE	LOCATION	BSRI SCORE
1	Reed Arena Expansion	Sports Complex	College Station, TX	650
2	Agriculture Program State Headquarters	Educational	Oklahoma City, OK	890
3	Interdisciplinary Life Sciences Building	Educational	Milwaukee, WI	750
4	New Campus Housing	Residential	College Station, TX	530
5	Mitchell Buildings	Commercial	Austin, TX	320

Benchmark

Minimum 100
Maximum 1000

Figure 7: Proposed project benchmarking system for BSRI

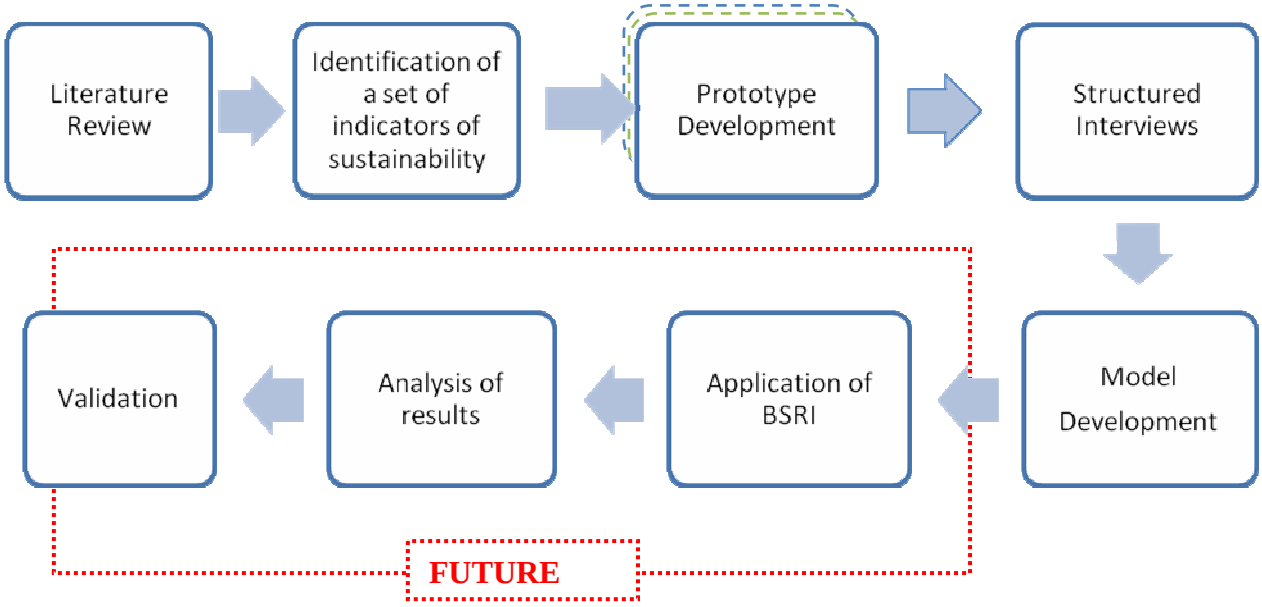

Figure 8: Proposed methodology for BSRI

7. Significance of proposed study

This research aims to deliver a building sustainability rating system which will be

- Easy to apply and will focus on macro as well as micro levels of building construction.
- Also this system will be focused on owner's sustainability perspective.
- The criteria's and indicators in BSRI will be well defined in order to reduce confusion and misunderstandings.

- The system will use adaptive weighted scoring system.
- Also BSRI will be an open system.

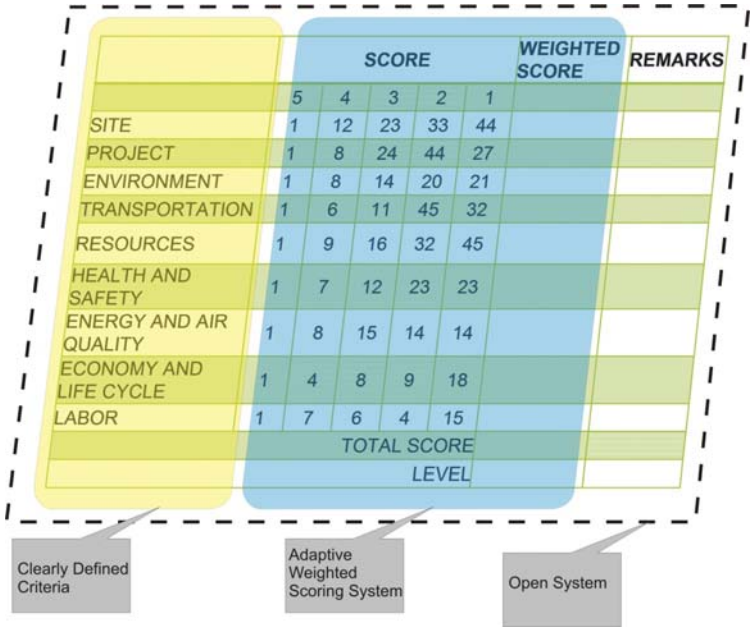

Figure 9: BSRI system demo

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Complaints Management Systems – Tools In Providing Good Quality Local Public Services Towards Sustainable Communities

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Abstract:
It is generally recognized that most of customer-focused organization like local authorities using Complaints Management Systems as tools to provide an opportunity to discover strengths and weaknesses in service provision, recognize areas for improvement and demonstrate high levels of community care in resolving issues. The paper draws on an exploratory study of the perception of Complaint Management Systems provided by local public services in the direction of sustainable communities' perspective. The aim of the paper is to investigate the discussion in the literature review about current issues which involved between Complaint Management Systems, local authorities and communities. This will lead to an identification of the gaps in knowledge and practice. Initial results reveal Community Management Systems facilitates the effectiveness of managing local public services with regards to better understanding and integrating the components issues of sustainable communities. The paper concludes by understandings the new perception of Complaints Management Systems in local authorities' services towards the achievement of sustainable communities. The need for a future review to add value the Complaint Management Systems from current factors of Sustainable Communities issues is very necessary.

Keywords:
Complaints, Local Authority, Sustainable Communities

1 Introduction

Living in places with high-quality value of services, a protective environment, accessible transport links, a strong sense of community and opportunities for all can be a desire for most people. These perspective needs are not strange anymore by the world in which councils and other local public services can provide. The related issues such as climate change, community cohesion, affordable housing, teenage pregnancy, and jobless are not things that can be solved overnight by simply doing more of the same but must be better. The issues can be resolved by requiring some innovations in local public services and facilities, which by definition, up to now the misleading perception still exist which makes local authorities to redesign the delivery systems by exploiting

the collective expertise and knowledge they hold to generate new ideas and tools from time to time. It is important to understand the direction of sustainable communities and how to relate it with the perception of complaint and feedback systems in local public services. This paper will investigate the discussion on perceptions of Complaint Management Systems from the angle of sustainable community's concept in local public services. The finding from thorough literature review will helps to understand the issues and suggest insights for designing further research. Thus the conclusion of this paper suggests new perception of complaint management systems should from the sustainable communities' outlook and the effect factors on local public services.

2 Literature Review

Roseland (2005) argued that the definition of sustainable communities was often perceived differently from different understanding. Roseland (2005) added that the community must be concerned and get involved in defining the meaning of sustainability from local perspective. The issue here was too often about how to encourage democracy (e.g. participatory local process) within a framework of sustainability. This has been the reason why as one of the criteria that sustainable communities needed is decent, affordable housing with enough hospitals, shops and schools to support the people who live in it. However there has been little discussion on how to relate people perception as a local community towards sustainability. Understanding the community and the sustainability leads to the definitions of sustainable communities. As derived by Kearns (2003) in the earlier definition of Sustainable Communities as settlements which met diverse needs of all existing and future residents; contribute to the high quality of life; and offer appropriate ladders of opportunity for household advancement, either locally or through external connections. They also limit the adverse external effects on the environment, society and economy" (Kearns, et al., 2003). It further support by Egan (2004) who is in a year later reviewed that a clear definition emerged as: "Sustainable communities meet the diverse needs on existing and future residents, their children and other users, contribute to the high quality of life and provide with opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economy prosperity" (Egan and Great Britain Office of the Deputy Prime, 2004). There has to be a significant when a paper written earlier by Kearns (2003) described six broad 'components' of sustainable communities which highlight most of key issues in future responsibilities by government agencies and local authorities (As shown in Table 1.0). It is important to understand the relationships between these components and its need to be considered since they convey some of the dynamic features of sustainable communities. Kearns (2003) added that some processes in these components support and sustain each other, while others challenge for improvements. Mostly part of the challenges that create and managing sustainable communities will involves of trying to make the most of the positive interactions and minimize the negative.

Table 1.0 'Components' of sustainable communities and its key issues. (Kearns, et al., 2003)

'Components' of sustainable communities	Key aspects/issues
Social and culture	The need to reconcile anti-social behaviour and 'liveability' Support for mixed tenure neighbourhoods and affordable housing Promotion of multi-cultural communities
Services	Well-performing local schools. Further & higher education and training for life-long learning. Effective primary health care and social welfare services. Local retail and consumption facilities. Cultural, leisure and sports amenities within easy reach
Built and residential environment	Energy efficiency, waste recycling, public spaces, residential density and the relative importance of environmental considerations in local and regional planning and development strategies
The Economics	The scope to increase labour demand in the towns and cities with a jobs deficit, and the combination of national, regional and local policies required to do so.
Governance	How to embed the significant cultural shifts represented by the sustainable community's agenda into the attitudes and behaviour of citizens and businesses towards the environment, society, economy and patterns of resource consumption.
Transport and connectivity	Issues for economic success, social inclusion and environmental concerns. There are difficult tensions between mobility, accessibility, choice, personal freedom, traffic congestion, pollution and other externalities.

2.1 Understanding Sustainable Communities

Sustainable communities can be a place where everybody wants to live and to have a decent job for a living for now and in the future. It can provide with decent, affordable homes with enough schools, hospitals and shops to support the people who live in them (Mark Roseland, 2005). In a social term, although sustainable communities can be associated with a particular place, it can also be applied to a network or group of people with a shared interest (Smith, 2008). However, Smith (2008) stated that in many discussions has preferred the meaning of community by actually to a particular area or the terms of neighbourhood. In 2003 the UK government launched what they described as the 'Communities Plan' - Sustainable Communities: Building for the future (ODPM, 2003). The plan set out a programme of action for 'delivering sustainable communities in both urban and rural areas'. Like many other government initiatives of the time, the plan was presented with positive responds from every government departments and agencies. However, the truth understanding and the impact of the plan may take a longer period of time to show it's successful. In order to regulate it, the plan defined sustainable communities as "places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all" (ODPM, 2003).

2.1.1 Criteria of Sustainable Communities

The government should knows that the development strategies of creating sustainable communities requires a change in the way of developing houses and communities and how they been planned, designed, built and maintained. Sustainable communities have about more than that. Its like on having the best neighbourhoods' area, the ones with the finest community spirit which working together to keep the area safe, environmentally healthy and well secured with jobs and trades good business opportunities (Smith, 2008). Sustainable community comes from a place where people are accepting of each other – it's more tolerance; it's a sense of pride in the area and its people. A good community actively encourages everyone to participate in its running, whether as volunteer or pushing issues that can help everyone. It should not be an area where the local leadership seems inaccessible (Smith, 2008). All aspects of the community should be well served. Sustainable community must have a sense of fairness, so that nobody feels unfairness, while every people can feel safe, on the streets or in their homes, and the people could taking care of each other. In an ideal world, a sustainable community would be environmental friendly, however it's hardly something that can be achieved, especially when deals with numerous kind of people (Camina, et al., 2004). Therefore the concept of Sustainable Communities must consistently be aware and promoted without persuading, just let the people make their own decisions. The need to have the right mechanism of doing this is crucial for the community to become sustainable.

2.1.2 Roles of the Communities

One of the perceptions in order to be sustainable is to have proper engagement approaches for the community. This has seen to be a key to the sustainability work. (Camina, et al., 2004). People must be willing to give their time and energy, to have and create a sense of pride in their neighbourhood, not just among the same age group of people. Communities' member from old, young, rich and poor must have the sense of sustainable; it is the way things used to be quite naturally. These days it takes far more work and conscious effort (Camina, et al., 2004). One question that needs to be asked, however, is whether who will be responsible to ensure that these people will get involve with the sustainable communities process in today situation.

2.1.3 Roles of the Local Authorities

Interestingly, sustainable communities can be delivered by local authorities/government alone. Relevant organizations' and agencies need to play their part, including central government and individuals within the communities themselves (Lafferty, 2001). No doubt, the private sectors in the same area have to play certain roles in the process of creating Sustainable Communities. Nevertheless local authorities have a critical role to play in creating sustainable communities, through effective local leadership and by making it possible for local people to get involved. However, above all, councils need to lead by example and ensured that sustainability becomes embedded into local services and council operations. Most of the local authorities and their agencies have imposed very successful Complaint Management System as an important part of quality public-sector service .Complaints and compliments are relatively valuable sources of information that most public organizations can use them to improve local services delivery and operations' for their communities (Berkley and Gupta, 1995).

2.2 Complaint

The Government deliver excellent services that promptly and efficiently satisfy clients. The public are clearly demanding greater service delivery, and enhancing service delivery it is an important government priority. Often public “customers” only want efficient transport, education or health services, not greater community capacity. However, delivering what public perceived needs is only part of the role of government. The government does little to stimulate the “rethinking”, social networks or leadership that builds the ability of communities to manage change. The performance of service delivery forms part of a new dual role for government that also includes the facilitation of community capacity. Thus, the processes of community engagement, partnership and facilitation could be considered as part of the “service” provided by government (Cavaye, et al., 1999) . Complaints and feedbacks, however, have been accepted as part of the delivering process. Complaints occur when the goverment fails to meet the communities’ expectations. Every government through local authorities, has been likely to receive complaints in every time of the delivering services (Plymire, 1992). Common causes of complaint include failure to do something when promised, inefficiency, rudeness, delays, failure to keep customers informed of changes and inflexibility (Brennan and Douglas, 2002). Brennan (2002) added to the list that causes of complaint would be also impolite, inexpert, incompetent services and often the result of lack of interest or distraction. Access, information and level out are three keys consumer principles at stake when examining consumer complaints in local council services. Access is concerned with consumers being able to obtain services required to make a complaint (Brennan and Douglas, 2002). Relevant, accurate and easily understood information has therefore important for consumers to make their complaints effectively, and remedy mechanisms will enable consumers to have services failures put right (Congress, 1993). When people's expectations exceed resources available or what a particular program is designed to provide, the public service organizations can use this knowledge to make the necessary adjustments. Even complaints can be a source of providing information on how to improve services quality for their communities to get, the need to know what communities' expectations are, what are the perceptions of the local public community from local authorities, how do they currently meeting them, and the extent to which the local authorities can meet them is also important. The main reasons why local authorities' perceived complaint positively from their service delivery are because they know that the communities have a right to complaint. Then they will seek a possible remedy for a decision that was unfair or wrong so that they can identify areas that need improvement. They can also save cost by resolving problems internally, which is close to the sources and prevent complaint from escalating and multiplying, a situation that can be resource-intensive and lead to adverse publicity. This can promote customer satisfaction which is a fundamental of good administrative practice.

Drafting Committee of Australian Standard on Complaint Handling Chair, Bill Dee, stated that the importance of government agencies to adopt an effective complaints management system is that it should:

1. Increase the level of user satisfaction with the delivery of services and enhance the user/agency relationship;
2. Recognize, promote and protect users’ rights, including the right to comment and complain;

3. Provide efficient, fair and accessible mechanisms for resolving user complaints; Provide with information to users on the complaints handling process for the service; and allow for monitoring of complaints and endeavour to improve the quality of services.

2.2.1 Complaint and Local Authorities

The UK government highlights the importance of remedy in its White Paper Modern Market: Confident Consumers (DTI, 1999). It acknowledges that when things go wrong people want to obtain redress quickly and easily. Things document sets out the extent of the problem in the UK and presents evidence to demonstrate that consumer complaints require effective complaints management systems (Simmons and Birchall, 2005). Local authorities will need a feedback mechanism so that they can work more excellence and meeting with the high expectation from their communities. These feedback concepts are actually referring to how local authorities and their local people build up their relationship between them. People will need to communicate with their local authorities so that they can alter their way of life to a much more quality than it's used to be (Gulland, 2007). Most of customer-focused organization like local authorities using the Complaint Management system to provide an opportunity to discover strengths and weaknesses in service provision identify areas for improvement and demonstrate high levels of community care in resolving the issues. In addition, complaints are not too often made for the purpose of pointing out who is right and who is wrong (Eccles and Durand, 1998). To resolve a complaint, which has to come from the positive side of it, the local authorities and the communities around them would need to give enough information, provide with an explanation, suggest a solution or, in situations where no solution is possible, express understanding and empathy. This is a significant aspect of achieving the successful of the relationship between the local authority and the communities (Government, 2008). Although with a proper complaint management system can provides direct ways to look deeper with local community issues and challenges to overcome them (Carney, 1996), the understanding of the relationship between the issues and the root of the problems, should become as the main concern.

Carney (1996) suggests some of the issues of complaint management are considered as follows:
1. Ensuring that they are not just tackling the problems which are easy to solve.
2. There is no measuring and monitoring positive changes in the special areas identified for improvement over a specific period of time.
3. Communicating the feedback and the findings effectively across the organization and the customers.

Gilly (1991) proposed that relatively few dissatisfy users are bothered to make a complaint about local public service performances. As a result, every complaint received may provide for a window into a much larger pool of dissatisfaction. Gilly (1991) suggested that by dealing with the causes of complaints, the organization can further reduce both the number of complaints and dissatisfaction with its program delivery or service (Gilly et al., 1991). Dissatisfied people in a community often speak poorly of an organization. The reputation and credibility of the government, and the public sector generally, may suffer as well. Research findings by Ball (2004) and his friends, shows that these dissatisfied people will tell up to 20 friends about an

unresolved problem. Compare to those people whose problems are resolved quickly tend to be more loyal to and supportive of the organization than those who do not experience any problems (Ball, et al., 2004). Although complaints may generate extra effort initially, they can, in the long run reduce an organization's workload. By dealing with complaints, systemic or recurring problems are dealt with thereby reducing further complaints in this area. The better ways of the local authority's handles complaints, will depend on what resources been available for them and the strength of partnership programs between government and private agencies. Organizations with limited resources must deal with complaints efficiently and strategically. Using a good complaint management system to manage complaints is more effective than providing ad hoc responses, which can lead to more serious complaints. A management system also has been considered to change information into the continuous improvement process, so that the organization can prevent similar future complaints. Although the statistic reveal rising levels of customer dissatisfaction, Linton (1995) suggests that complaints are vital to a customer-focused organization. They provide an opportunity to discover weakness in service provision, identify areas for improvement and demonstrate high levels of customer care in resolving the issues. (Linton, 1995).

2.2.2 The Significant of Complaint Management System

The significant impact of the Complaint Management Systems as a tool in people expectation concerning service quality and standards is in the creation of a culture where complaints are positively welcomed and encouraged by various of range of organizations, has itself increased customer expectations concerning the likely outcomes and resolutions to those complaints.(Carney, 1996). Referred to Westminster Social Services Department Report when they started to deal with six thousand complaints within six years of survey were concerning a diverse range of services and issues. The complexity of the complaints was varied enormously from straightforward, day to day service delivery matters, to extremely detailed representation concerning major policy and resource issues (Carney, 1996). This shows that the information from complaints can be used to plan future service provision and inform policy making. A small research study points out some of the recommendations regarding a high quality complaint procedure. (De Meester and Mahieu, 1999). If the local authorities as service provider, would not respond objectively to the local people problems, the people will then conveying their friends and community family, the local paper, national press and media, Citizens Advice, Watchdogs, their solicitor and the internet postings until the list goes on. As outrageous as it may sometimes seem, complaints management is simply a public/business/professional organization challenges similar to all those other challenges face. Just like other challenges, the local authority need to develop effective strategies. Research proves that effectively dealing with complaints increases customer loyalty. The critical issue about complaint management is that it is not necessary the failure itself that leads to customer dissatisfaction, many customers accept that thing can go wrong. It is more likely to be the organization's responses (or lack of response) to a failure that causes satisfaction (or dissatisfactions), (Johnston, 2001). Complaint management and quality assurance seem at the beginning to be conversely proportional to each other. Quality represents the satisfactions of the requirements and expectations of the client while complaints are the opposite of quality in the delivering service. In other words, the fewer the complaints, the higher the quality of the perceived or delivered service will be (Zeithaml, et al., 1996). It is the quality management future

view that the purpose of avoiding or preventing dissatisfaction or complaints as part of quality components within the delivering services. However these actually strived towards an 'inhuman' objective: all organizations work with people and people make mistakes. Complaint management is a demonstration view upon a client's individual experience that is not in accordance with his or her conception of a 'good' organization. Firstly, complaint management attempts to redress a client's grievances or dissatisfaction. Secondly, it analyses the process of the development of the specific complaint. The collected information becomes the input for a prospective view. From this point of view, quality-friendly organizations do not try to avoid or prevent complaints but avoid making the same mistake again (Bosch and Enriquez, 2005). To understand the Sustainable Communities however, for some people are mostly complicated. They want to get everything right but at the same time do not want to take part on the process of Sustainable Communities. Local public services provider therefore have to take lot of effective and initiatives ways to resolve the community issues by introduced many of the programs and community projects. The relationship between the community and local public services should have some major criteria that must by both side to understand and committed to the needs.

3 Research Methodology

This paper concentrates on two objectives of the research. First, it focuses on the principle values of sustainable communities and the existing concept of complaint . Second, it discusses the present understanding of the benefit of complaint management systems towards the relationship between the public service organizations in delivering sustainable communities objectives. To achieve these two objectives, the approach is mainly a review of literature on complaints, its management systems and its relationship with the performance of local authorities as public service provider towards sustainable communities. The definition of literature review can be known as the selection of available documents (both published and unpublished) on the topic which contain information, ideas, data and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed (Hart, 1998). Although this is only part of the bigger picture of the research methodology, it has been very helpful in finding and structuring a particular standpoint of the evidence starting from initial process of the research towards the end.

4 Findings and Discussion

The discussion about sustainable communities and how it should be understand by most people has been something that very straight forward. The value of getting sustainable communities is very high. Almost every community development required three elements of sustainable communities. These elements consist of economic, environmental and society must be well integrated, however its raise a question of how all of these can make it happened, especially when local authorities get involves. Kearns (2003) described six broad 'components' of sustainable communities which highlight the key issues by relevant agencies and local authorities in future. The relationships between these components need to be considered since they express dynamic characteristics of sustainable communities. The challenge that create and managing

sustainable communities involves trying to make the most of the positive interactions and minimize the negative. From here, the relevancy stage of Complaint Management systems as implemented by Local Authorities and other public agencies will be higher than before if taken these 'components' and their key issues as a strategic agenda to create sustainable communities. The community percept's people from local authorities to work with them rather than just for them, it is a real partnership, to help them shaping their future. The determination of whether existing complaint management systems are adequate, local authority as a service provider will find some essential features of a good system and the questions people should ask themselves to evaluate existing systems. The information from the complaints can and has been used to plan future services provision and inform policy making. As a result, major areas of complaint have been addressed and a high percentage of solutions to customer dissatisfaction about the department's services identified.

5 Conclusion and Further Research

The understanding of both commitment and responsibilities of complaint handling should outline a real relationship between local authorities and local communities. The relationship will be proved that no doubt the issues can be resolved instantly or individually manner, thus it will created the situation that no body will get stressful impacts and therefore create a considerable amount to issues unsolved. The determination of whether existing complaint management systems are adequate, local authority as a service provider will find some essential features of a good system and the questions people should ask themselves to evaluate existing systems. The information from the complaints can and has been used to plan future services provision and inform policy making. As a result, major areas of complaint have been addressed and a high percentage of solutions to customer dissatisfaction about the department's services identified. A complaint management system is not an end in itself but rather can be a tool for improving outcomes through intensive, integrated intervention in local communities experiencing significant economic and social disadvantage. Not all places require this kind of response. Complaint management systems have been intensively used by the local public services providers but limited intervention at a very local level. Limitations are in terms of the number of areas that can be targeted at any one time as well as the duration of intervention. More integrated targeting of mainstream programs and services as well as better regional coordination of service delivery are required to enhance government's responsiveness to local communities. However, this will require some hard thinking about how resources are allocated to best effect and how outcomes are measured holistically rather than being obsessed with inputs and outputs. Finally, improving responses to local communities will require attention to issues of culture and relationships and an end to defensive, compartmentalized mentalities and behaviours in the public sector at all levels. Sustainability considerations need to be pursued as everyone's responsibility, from government to citizen and private enterprise. Sustainable communities require 'mainstreaming', not simply into government departments and public services, but into the everyday practices of the economy and wider society.

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Practice of disaster risk reduction in post-disaster infrastructure reconstruction in Sri Lanka: *success or failure?*

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Abstract
Disasters resulting from natural hazards such as floods, drought, earthquakes, cyclones impact societies in several ways, while damaging lives, infrastructure and resulting in financial and environmental losses. Therefore, prevention of disasters through reducing disaster risk has been critically important to minimise the impact of disasters. A proactive stance to reduce the toll of disasters requires an approach with both pre-disaster risk reduction and post-disaster recovery. However, the world is gradually shifting from disaster response to a more proactive approach to disaster management. However, integration of disaster risk has been identified as a key priority within the post disaster reconstruction process. Accordingly, the main aim of this paper is to draw attention to the importance of integration of disaster risk reduction in to post-disaster infrastructure reconstruction, which is a part of a doctoral research. Infrastructure reconstruction programs aim to change the vulnerable conditions for the development of the country. It is well identified that all critical infrastructure facilities must be designed to a given level of safety from disaster impact. The research based on which this paper is written aims to reveal the contribution of integration of disaster risk reduction into post-disaster infrastructure reconstruction on economic development. This paper reveals the disaster risk strategies used in general and in specific to the post-tsunami infrastructure sector in Sri Lanka and discovers their success rate. Further, the paper discusses the challenges associated with integration of disaster reduction into post-tsunami infrastructure reconstruction projects.

Keywords - Development, Disaster risk reduction, Challenges, Infrastructure reconstruction

1 Introduction: Natural disasters and reconstruction

The recent statistics evidence every single space in the earth is prone to a variety of natural and man-made disasters. No where is safe as it was used to be. Within this

context, the frequency, intensity, diversity and consequences of disasters in Asia also has been extremely complex. According to recent statistics, the Asia-Pacific region experiences nearly 60 percent of the world's natural disasters (Metri, 2006). In much of a similar manner, Sri Lanka too has become a country, which regularly experiences different types of natural disasters such as floods, heavy rains, droughts, landslides, cyclones etc. With the recent tsunami took place in 2004, Sri Lanka simply became a country being vulnerability to low-frequency high impact events such as tsunamis. These regular events ended up with increased losses to life and property in the past few decades (Jayawardane, 2006). The recent flood records during May and June 2008 due to persistent rain brought the death toll to twenty and further thousands of people were internally displaced and happened to be sheltered in temporary places.

Every major disaster is followed by massive efforts for rehabilitation and reconstruction by the national and local governments, international agencies and the global community. This provides opportunity for building back better and affords an opportunity to further strengthen the techno legal regime for safer habitat and for better construction and other practices in areas which are prone to disasters. In other words, disasters provide physical, social, political and environmental development windows of opportunities that can be used during the post-disaster recovery and reconstruction to not only to reconstruct the impacted areas, but also to improve the socio-economic and physical conditions of the impacted population in the long run (Asgary *et al*. 2006).

2 Development issues generated out of natural disasters and vice versa

2.1 Impact of development on disasters

Natural disaster is intimately connected to the processes of human development (UNDP, 2004). According to Jigyasu (2002), the link between disasters and development is very critical. Lewis (1999) questions which way round should it be; 'disasters and development' or 'development and disasters'? The development choices made by individuals, communities and nations can pave the way for unequal distributions of disaster risks (UNDP, 2004). In a vicious cycle, development processes contribute to the number and scale of disasters (Wijkman & Timberlake, 1984 cited in Lyons, 2008), increasing vulnerability to future disasters and undermining future recovery and development (Lyons, 2008). It has been clearly demonstrated how disaster risk accumulates historically through inappropriate development interventions (UNDP, 2004). On the other hand, every health centre or school that collapses in an earthquake and every road or bridge that is washed away in a flood began as development activities.

2.2 Impact of disasters on development

Not only are disasters the consequences of existing 'development' processes; disasters on its own can also set back development. Disasters resulting from natural hazards such as floods, drought, earthquakes, cyclones and forest fires impact development in several ways (Bendimerad, 2003). Disasters triggered by natural hazards put development gains at risk (UNDP, 2004). Meeting the Millennium Development Goals (MDGs) is

extremely challenged in many communities and countries by losses from disasters triggered by natural hazards (UNDP, 2004).

The destruction of infrastructure, the erosion of livelihoods, damage to the integrity of ecosystems and architectural heritage (UNDP, 2004), reduce human capital as a result of the deaths, injuries and long-term trauma suffered by affected individuals are direct out comes of disasters (Bendimerad, 2003). But disaster losses interact with and can also aggravate other stresses and shocks such as a financial crisis, a political or social conflict, disease (especially HIV/AIDS), and environmental degradation (UNDP, 2004). And such disaster losses may set back social investments aiming to or originally planned for development and service provision, ameliorate poverty and hunger, provide access to education, health services, safe housing, drinking water and sanitation, or to protect the environment as well as economic investments that provide employment and income mainly due to funding redirected to rehabilitation and reconstruction requirements. (Bendimerad, 2003; UNDP, 2004). Thus, disasters delay development programs by reducing available assets and interrupting planning (Bendimerad, 2003). Disasters also decrease the economic potential of society by exacerbating poverty, disrupting small business and industry activities, and disabling lifelines vital for economic activity and service delivery (Bendimerad, 2003).

Not only are disasters set back development processes, they can also serve to provide new opportunities for development through post-disaster reconstruction (Jigyasu, 2002). Davis (2005) claimed that looking at disasters as development opportunities is becoming one of the core principles of disaster and emergency management (Asgary *et al*. 2006). Conventionally, reconstruction and development were perceived and represented linearly (Lewis, 1999). In reality however, they are simultaneous, each 'stage' overlapping with others and in response to the same or different disasters (Lewis, 1999). The 'disaster continuum' approach positively attempts to align post-disaster assistance with development, recognising the intervening stages of recovery, rehabilitation and reconstruction as each stage should lead to the other in that sequence (Lewis 1999). Thus, post-disaster reconstruction is relevant to development discourse. But, it is essential, not only to cope with the impacts but also to help ensure that the region sustains its economic growth (UN-ESCAP, 2006). Lewis (1999) clearly admits that, in any case, development will have been taking place appropriately or inappropriately, planned or unplanned, successfully or not, for a long time. However, it is argued that there is a limited time frame of approximately two years for such opportunities to be utilised efficiently (Asgary *et al*. 2006). Moreover, reconstruction must take into account the implications in reducing disaster vulnerability in the long term (Jigyasu, 2002). Whilst the need for mitigation and reduction of natural disaster risks has been widely recognised all over the world, achieving this ambitious goal has proven difficult in Sri Lanka. Calls have been made for a country like Sri Lanka to inform and design development efforts to reduce natural disaster related losses, and contribute to truly sustainable social and economic development.

3 Integration of disaster risk reduction into post-disaster reconstruction

3.1 Disaster risk reduction at a glance

Disaster risk reduction is aimed at tackling the fundamental elements of disaster risk: vulnerability, hazards and exposure (DFID, 2006). It entails measures to curb disaster losses by addressing hazards and the vulnerability of people to them (DFID, 2004). 'UN International Strategy for Disaster Reduction' defines the term 'Disaster risk reduction' as 'the systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society' (2004). Reducing disaster risk is not just about additional investments-it is also about ensuring that development interventions are sound, for example, ensuring appropriate construction of infrastructure in highly vulnerable areas (DFID, 2006). Disaster risk reduction seeks to pre-empt a disaster, but should also be a feature of rehabilitation following a disaster in order to (re)build resilience to future disasters (DFID, 2004). This opens an opportunity for continuity of engagement with local and national actors (DFID, 2004). Within this context, the development and donor communities show an increased commitment to reducing disaster risk and vulnerability, and towards integrating or mainstreaming disaster preparedness, or disaster risk reduction, into development planning (DFID, 2005).

Disaster risk reduction measures can be categorised in various ways. One such general way is policy and planning measures, physical preventative measures, physical coping and/or adaptive measures; and community capacity building (DFID, 2005). All measures are of paramount importance for post-disaster infrastructure reconstruction. Policy & planning measures include (i) Implement a national plan for protection against disasters, including preparedness and contingency planning (ii) Land-use planning that better incorporates risk of flooding (iii) Integrated management of flooding and water supply (iv) Integrated warning and response system (v) Improving networks / links with local governments (DFID, 2005). Physical (Prevention) measures includes (i) Flood defences (eg: Dam, multipurpose, seaborne etc) and sea wall (ii) Natural protection against floods (eg: reforestation of watersheds) (iii) Installation of drainage pumps (DFID, 2005). Physical (coping /adaptive) measures include (i) Raised plat forms (equipped with latrines and drinking water) (ii) More resilient roads and infrastructure (eg: raised roads) (iii) More resilient water supply systems (eg: boreholes, raised hand-pumps) (vi) Design and building of contingency mechanisms for coping with disasters, (eg: escape roads) (DFID, 2005). Community level capacity building measures include (i) Community based disaster preparedness-communities trained in disaster preparedness (ii) Public warning system (iii) Safety nets to ensure that poor households can rebuild productive livelihoods (through building on existing programmes) (iv) Revolving funds managed by the community used to better cope in disaster situations (eg: for storing and distributing food) (DFID, 2005).

The frequency with which some countries experience natural disasters should certainly place disaster risk at the forefront of development planners' minds (UNDP, 2004). For example, Mozambique faces a regular cycle of droughts and floods: 1976-1978 (floods), 1981-1984 (drought), 1991-1993 (drought), 1996-1998 (floods), 1999-2000 (floods)

(UNDP, 2004). In this manner, the prominent role that disaster risk reduction should play within the context of post-disaster reconstruction needs to be well understood in order to utilize the opportunities created by natural disasters at its best.

An effective disaster reduction management strategy for each disaster prone nation needs to be a comprehensive one. Such a strategy needs to be mainstreamed into various policies on infrastructure, agriculture, housing and natural resource management. This also means that a clear and responsible government coordination mechanism needs to be established and maintained at all times. Here, capacity development and knowledge on international best practice need to be transferred to other countries.

UNDP (2004) identifies two types of disaster risk management; Prospective disaster risk management and Compensatory disaster risk (UNDP, 2004). Prospective disaster risk management should be integrated into sustainable development planning (UNDP, 2004). Development programmes and projects need to be seen in the context of the disaster-development relationship and reviewed for (UNDP, 2004) potential future impacts on the reduction or aggravation of vulnerability and hazard (UNDP, 2004). Compensatory disaster risk management stands alongside development planning and is focussed on the amelioration of existing vulnerability and reduction of natural hazard (UNDP, 2004). Compensatory policy is necessary to reduce contemporary risk, but prospective policy is required for medium- to long-term disaster risk reduction (UNDP, 2004).

3.2 Disaster risk reduction for development: Economic development and millennium development goals (MDGs)

A DFID scoping study found that poverty alleviation, development and disaster risk reduction (DRR) are highly correlated (DFID, 2005). It was argued that inadequate attention to disaster risk reduction can hinder progress in poverty alleviation and development (DFID, 2005). Despite the various global, national, regional and local initiatives on mainstreaming disaster risk reduction in development, disasters continue to strike in parts of the globe causing damages to life, property and infrastructure and providing setbacks to development (UNDP, 2004). There are projections that increasing vulnerabilities of people, particularly those living in unsafe buildings and unplanned settlements in urban areas and the environmental changes precipitated by climate change would increase the incidents of disasters, particularly in the developing countries (UNDP, 2004).

Unfortunately, past experiences for post disaster rehabilitation and reconstruction have not always been very satisfactory (ADB, 2007). While there are excellent examples of reconstruction that ensured that every house that is rebuilt and every infrastructure that is redeveloped is disaster proof, there are also many examples of reconstruction which has only served to recreate the vulnerabilities by poor designs, technologies, materials and other practices (ADB, 2007).

An Independent Evaluation Group (IEG) study of the World Bank assisted reconstruction projects during the past twenty years has shown that over sixty percent of the completed projects in the disaster portfolio were either struck by a subsequent

disaster during implementation or had their implementation process interrupted by disasters and 40 percent of project-constructed infrastructure or project activities had been compromised to some degree (ADB, 2007). In 121 of 197 completed projects with a strong focus on mitigation, which were supposed to use disaster-resilient reconstruction standards, evaluations of 31 projects (26 percent) acknowledged flaws in the design, leading in 13 cases to severe damage by a subsequent event, and in 6 cases to partial damage (ADB, 2007). More recent projects attempt to increase resiliency and prevent destruction through mitigation measures. Still, this is a disturbing finding, and more needs to be done (ADB, 2007).

Achieving a more sustainable development and one that moves towards the meeting of the MDGs will not be possible while disaster risk management is left outside of development (UNDP, 2004). The challenge for integration lies in devising the tools required for policy makers to transparently justify the closer operation of disaster and development policy (UNDP, 2004). Bringing disaster risk reduction and development concerns closer together requires three steps:

1. The collection of basic data on disaster risk and the development of planning tools to track the changing relationship between development policy and disaster risk levels
2. The collation and dissemination of best practice in development planning and policy that reduce disaster risk
3. The galvanising of political will to reorient both the development and disaster management sectors (UNDP, 2004)

Each of MDGs goals seemingly interact with disaster risk and contribute to a reduction of human vulnerability to natural hazard (UN/ISDR, 2004). However, the processes undertaken in meeting each goal is a key determinant of the extent to which disaster risk is reduced (UN/ISDR, 2004). Post-disaster infrastructure reconstruction directly affects the disaster risk reduction in numerous ways and disaster risk reduction is an important aspect, which needs to be fully attained during the reconstruction of infrastructure. For instance, simply building an infrastructure project is not enough for a sustainable and long-term development gain, infrastructure exposed to natural hazard must be disaster resistant, and people using them need to prepare for disaster (UN/ISDR, 2004).

This implies a two-way relationship between the kinds of development planning that can lead to the achievement of the MDGs and the development processes that are currently associated with an accumulation of disaster risk (UN/ISDR, 2004). Unless disaster risk considerations are factored into all development related to the MDGs, well-meaning efforts to increase social and economic development might inadvertently increase disaster risk (UN/ISDR, 2004).

The World Development Report 1994, the seventeenth in the annual series of the World Bank (1994), examines the link between the infrastructure and development and explores ways in which developing countries can improve both the provision and the quality of infrastructure services. In the World Development Report 1994, the World Bank describes the direct links of infrastructure to poverty (Freeman, 1999). In fact, access to sanitation, electricity, and clean water, all supplied by infrastructure, are

measures of poverty. Freeman (1999) admitted that the clear link of natural disasters to poverty is through infrastructure. Accordingly, it is convinced that the linkages can be described in at least three components:

1. Access to infrastructure is often a measure of poverty,
2. Infrastructure is a key component of economic growth,
3. Loss of infrastructure may have significant indirect and secondary costs that directly affect the poor (Freeman, 1999).

Effective post-disaster infrastructure reconstruction has a key role to play within 'Eradication of extreme poverty and hunger', which is the most first millennium development goal. At the national level, reducing disaster risk is often contingent upon alleviating poverty and vice versa (UN/ISDR, 2004). Hunger reduces individual capacity to cope with disaster stress and shock and disasters can destroy assets leading to hunger (UN/ISDR, 2004). Therefore, effective post-disaster infrastructure reconstruction is of paramount importance for the achievement of the first MDG, which directly correlates with reduction of poverty through adequate access to and quality of such infrastructure.

The MDG goal 7, 'ensure environmental sustainability' targets to integrate the principles of sustainable development into country policies and program and reverse the loss of environmental resources. It also targets to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. The main two indicator of this target are (1) the proportion of population with sustainable access to an improved water source, urban and rural (2) the proportion of population with access to improved sanitation, urban and rural. These two indicators appear to be the indicators of effective post-disaster infrastructure reconstruction too.

4 Discussion

4.1 Disaster risk reduction strategies in practice and their success level of implementation: Post-tsunami infrastructure reconstruction in Sri Lanka

The research based on which this paper is written aims to reveal the contribution of integration of disaster risk reduction into post-disaster infrastructure reconstruction on economic development. The study will seek to collect data under two main categories, namely data from case studies and High-level policy makers. Case studies will be conducted among post-tsunami infrastructure reconstruction projects in Sri Lanka. Accordingly, the 'unit of analysis' of the study will be the 'disaster risk reduction in post-tsunami infrastructure reconstruction projects'. The purpose of identifying the unit of analysis is to recognise where the focus or 'heart' of the research lies within the boundary (Miles and Huberman, 1994). The 'unit of analysis' is a 'phenomenon of some sort of occurring in a bounded context' (Miles and Huberman, 1994).

As this paper presents a part of the main doctoral research, the main objective of this section is to present the pilot interview findings, which was conducted to address mainly two issues; (1) identify the disaster risk strategies used in general and in specific to the post-tsunami infrastructure sector in Sri Lanka and their success rates (2) identify

challenges associated with integration of disaster reduction into post-tsunami infrastructure reconstruction projects. The pilot study took the form of a semi-structured interview. The facts discovered through the interview were in fact related to a post-tsunami road reconstruction project in the eastern Sri Lanka.

This section elaborates on the research findings of the pilot study. Disaster risk reduction strategies listed below were identified through a literature synthesis. The aim of the pilot interview was to discover the level of importance given to these strategies by the built environment professionals and extent to which those have been implemented within the post-tsunami infrastructure reconstruction sector in Sri Lanka. The findings are elaborated in the table 1. Though all these strategies were ranked as 'Highly Important' or 'Important', they are not likely to be implemented at a satisfactory level. Most of the disaster risk reduction strategies have been averagely implemented except land-use planning. This strategy has not been taken into consideration during the post-tsunami infrastructure reconstruction, though it is a critical measure of future disaster risk reduction.

4.2 Challenges and opportunities associated with integration of disaster risk reduction into post-disaster infrastructure reconstruction

The process of post-disaster reconstruction proceeds ahead with many challenges as always. Sri Lanka as a developing country and an un-experienced nation in reconstruction in much of a major scale faces many challenges superseding the existing opportunities. Lack of institutional capacity at local government level to plan and implement recovery strategies is usually very limited and often incapacitated as a result of the disaster. Stable and secure post-disaster recovery and long term development is threatened by institutional constraints, lack of access to inappropriate use of professional skills and knowledge to support local effort. Poor standards and lack of knowledge about disaster risk reduction of the local construction industry have affected the poor pace of reconstruction and lack of successful implementation of disaster risk reduction.

RICS, "Mind the GAP report" by Lloyd–Jones (2006) highlights the ineffectiveness of medium-term recovery and long-term reconstruction due to lack of planning and co-ordinated management in the post-disaster recovery phase despite the huge improvements in the emergency response. Stable and secure post-tsunami infrastructure reconstruction is threatened by gaps in communication and failures in management, planning and coordination where many parties are involved. These challenges consequently resulted in poor planning and implementation of disaster risk reduction and integrating the within post-disaster infrastructure reconstruction.

Table 1: Disaster risk reduction strategies: Level of importance Vs level of implementation

Level of Importance						Disaster Risk Reduction Strategies	Level of Implementation					
Highly Important	Important	Averagely Important	Slightly Important	Unimportant	No Idea		Well Implemented	Implemented	Averagely Implemented	Slightly Implemented	Not at all	No idea
x						National plan for protection against disasters, including preparedness and contingency planning				x		
	x					Land-use planning that better incorporates risk of flooding					x	
	x					Integrated management of flooding & water supply						x
x						Integrated warning and response system		x				
x						Improving networks / links with local governments			x			
	x					Codes, policies and procedures to protect infrastructure safety		x				
x						Infrastructure safety programmes		x				
	x					Guidelines for implementation of disaster risk reduction strategies			x			
x						Design & building of contingency mechanisms for coping with disasters, (eg: escape roads)			x			
		x				National critical infrastructure assurance programmes, including protection & emergency preparedness measures						x
x						Coordinated approach to the provision of infrastructure that meets requirements for disaster risk reduction		x				
	x					Mechanisms to maintain appropriate standards of reliability of critical infrastructure			x			
x						Current and potential procedures for conducting infrastructure risk assessment		x				
	x					Regularly threat, incident and vulnerability analyses of infrastructure			x			
x						More resilient roads and infrastructure (eg: raised roads		x				
x						Flood defences (eg: Dam, multipurpose, seaborne etc) and sea wall		x				
x						Adequate coordination of critical infrastructure protection responsibilities among various project stakeholders			x			
x						Capacity building programmes for project stake holders on disaster risk reduction			x			
x						Mechanisms to raise awareness among parties involved in reconstruction about critical infrastructure safety			x			

Some of the challenges are directly associated with design and construction of infrastructure facilities. Although it's difficult to give an exact percentage, no soil permeability tests had been carried out before the design of soak-ways in most Tsunami Reconstruction Projects (Hettiarachchi, 2008). The typical shortcomings related to design and construction of sanitation facilities were mainly caused by lack of knowledge about the sanitation techniques and methods available, lack of awareness about the existing standards and regulations on sanitation in the country, inadequate professional input in design and construction supervision, ineffective monitoring by the relevant authorities (i.e. Environmental Officers/PHI of Local Authorities, Central Environmental Authority etc.), absence of a proper mechanism to evaluate the appropriateness of the sanitation facilities by the approving agency of the project (Hettiarachchi, 2008). But unlike in the case of immediate relief & intermediate rehabilitation the institutions involved in Permanent Rehabilitation work had a basic understanding about the importance of providing access to sanitation (Hettiarachchi, 2008). The shortcomings in awareness of them are mostly associated with inability to assess the appropriateness of sanitation techniques, lack of awareness about the different technical options available in Sri Lanka for providing sanitation and poor understanding about the environmental problems related to inadequate & improper sanitation (Hettiarachchi, 2008). Therefore it is important to ensure a substantial improvement of sanitation literacy among the building industry professionals in coming years to avoid the repetition of mistakes and blunders made in the 2004 Tsunami rehabilitation work (Hettiarachchi, 2008).

Further, the government's procurement methods are very lengthy and tedious, which makes the reconstruction process very slow, for instance procurement problems with regard to tools, equipment and vehicles for implementation/supervision have become a serious delay causing factor in water supply and sanitation projects. On the other hand non-availability of resources such as suitable rock for road works has delayed road reconstruction work. Further, obtaining labour power for reconstruction in north and east of the country had also been major issue. One way to overcome the resource problem is to commence a project where resources are available and continue on without phasing the project. This strategy will be helpful in road reconstruction projects. This can be of course carried out using the fast-track method of construction.

5 Conclusion

Poverty alleviation, development and disaster risk reduction are highly correlated. It was argued that inadequate attention to disaster risk reduction can hinder progress in poverty alleviation and development. Achieving a more sustainable development, and one that moves towards the meeting of the millennium development goals, will not be possible while disaster risk management is left outside of development. Unfortunately, past experiences for post disaster rehabilitation and reconstruction have not always been very satisfactory. Though post disaster reconstruction has acquired an increased level of attention of many governments, environmental campaigners, scientists and various other stakeholders, both in the developing and the developed world and simultaneously there are many theoretically identified disaster risk reduction measures which seems applicable to post-disaster reconstruction and development, the post-tsunami infrastructure reconstruction in Sri Lanka is not at its best in terms of integration of

disaster risk reduction into the process. This is due to some inherited challenges at various levels of the structure of the reconstruction mechanism such as lack of knowledge, capacity, mismanagement and lack of funding. Implementation of national plan for protection against disasters, including preparedness and contingency planning, and land-use planning that better incorporates risk of flooding, integrated management of flooding & water supply etc are not well implemented. Therefore, there is a high demand to make aware the built environment professionals about the values of integrating disaster risk reduction into post-disaster infrastructure reconstruction.

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GFRP as an internal reinforcement in concrete structures

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Abstract:
Many problems are caused by corrosion of steel reinforcement in concrete. Bridges, foundation slabs and other structures are highly loaded by unfriendly environment. Non-metallic reinforcement performs a new solution in terms of corrosion proof ability and other excellent characteristic. Nevertheless some fundamental differences can be found between the behaviour of concrete with steel reinforcement and concrete reinforced with GFRP (Glass Fibre Reinforced Polymers). Experimental program is chosen in order to investigate properly all real aspects of the application of this newly developed reinforcement in concrete. The basic finding should help engineers and designers in application of this newly develop composite reinforcement in particular sites.

Keywords:
Composites, concrete, GFRP, pre-stressing, reinforcement

1 Introduction

High strength, low weight, thermal and electric non-conductivity, resistance to salt water and to other chemicals and are the biggest advantages of GFRP. Carbon lamellas externally glued to the structural elements are well known. Application of FRP bars as an internal reinforcement is quite new. Moreover a newly developed GFRP bar is implemented based on the best surface layout that secure the best cohesion with concrete (Fornůsek at al., 2008).

There is no guide for design concrete structures with GFRP in the Czech Republic. Since the material characteristics of GFRP differs from steel (Michna, 2006) some research must be done in this area. Composite reinforcement based on glass fibres and matrix can improve structural properties from nano to macro level.

GFRP bars consists of thousands micro fibres glued together with an epoxy resin. Single fibres carry all tension stress. Epoxy resin takes care of the proper placing and divides equally tension stress in to all fibres (Wollmann et al., 2006).

2 Background

Composite reinforcement is quite new matter nevertheless some research has been already done throughout the world. So why another one? The composite materials including GFRP are very specific and let's say every factory has its special recipe. It's like a finger prints, similar but not the same. Every one is original. GFRP bar consist of two main parts - glass fibres and matrix. Every part can be chosen according to the specific needs of the customer. Moreover by mixing these two parts together it is given that the final characteristics of the entire rod would be different than characteristics that would be obtained by simple summation of properties of glass and matrix. This effect is called synergism (Michna, 2006). Therefore another research is performer in this specific area in order to establish and clarify behaviour of concrete structures reinforced with this newly developed GFRP reinforcement.

3 Research Methodology

Research has been set in order to satisfy basic tasks regarding reinforced concrete - cohesion of GFRP and concrete and stress-strain diagrams of GFRP reinforced slab. Practically there are two ways for approach - numerical and experimental. Since there are lots of unknown inputs for numerical model, experimental program has been chosen first.

Since the bar with the most appropriate surface layout has been chosen (Fornůsek at al., 2008) simple design of concrete slab has been calculated. Slab dimensions have been set by the maximum ability of the laboratory equipment. A basic equation of elasticity has been implemented for the slab design (Jirásek at al., 2002). Therefore an approximate deflection has been solved in order to pick proper sensors that can span entire deflection field. Potentiometer sensors have been chosen as a sufficient measuring device.

Four point bending test has been performed in order to avoid localization of the maximum moment in case of three point bending test. Two sensors have been placed under each loading point and one in the middle of the slab to record continuous deflection line. Acting force has been recorded together with deformations. Data has been analysed in DeWe5000 with help of powerful DeWe-Software (DEWESoft v.6.4, 2006). On-line video monitoring of the most loaded part of the slab in between of the loading points together with on-line stress-strain diagram and deflection values recorded in 5Hz frequency enable perfectly see when first cracks appear under which load and what a deflection is about. Load has been provided by a hydraulic compacting machine. In order to ensure static loading machine has been driven by the force with increments 1kN per 7 seconds. Therefore 5Hz monitoring frequency is sufficient enough. Experimental program therefore shows unique record that can be hardly replaced only by numerical readings.

Figure 1. Experimental layout (concrete slab with GFRP - sensors underneath - measuring station)

Nevertheless based on the experimental outcome numerical approach has been performed anyway in ATENA software (Advance Tool for Engineering Non-linear Analysis). ATENA presents a powerful instrument in non-linear modelling of concrete members including huge material library (Červenka et al., 2006). Special bond model (Fornůsek at al., 2008) has been implemented together with Newton-Raphson method including the line-search method in order to speed-up the calculation procedure (Bittnar et al., 1992). When a good correlation is found between the numerical and experimental outcome therefore it is possible to predict behaviour of even another types of FRP reinforced concrete. If there is another company distributing FRP material than it is just enough to implement basic material characteristic of the FRP bar (E modulus, bond model, etc.) in to the numerical model and it's possible to predict at least approximately deflections, crack development and other important structural information.

4 Findings and Discussion

Behaviour of the traditionally reinforced slab with a steel reinforcement can be divided into tree major parts. In un-cracked stage slab behaves linearly up to the first cracks, when the tensile strength of the concrete is reached. When the cracks appeared, the stiffness of the slab goes down. In this point reinforcement starts to work. All tensile stresses are taken by the reinforcement itself. This is stage two. It last up to the point where the steel yields. Afterwards third stage begins, called cracked-inelastic. This stage is characteristics by a rapid increase of deformation with a minimum increase of the force. At the end of this stage slab fails (Procházka, 1993).

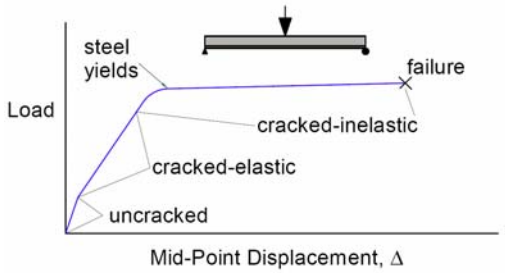

Figure 2. Stress-strain diagram of concrete member with steel reinforcement
(Source: Wollmann et al., 2006)

Behaviour of the slab reinforced with a Glass Fibre Reinforced Polymers can be divided into a two parts only. First stage goes hand in hand with slab with a steel reinforcement. When the tensile strength of the concrete is reached, stiffness of the slab decrease and GFRP reinforcement start to work. This stage continues more or less linearly up to the point where the strength of the GFRP bar is reached. At this point GFRP breaks without any previous signs. No rapid or spontaneous increase of deformation or cracks can be seen. Therefore slabs itself fails as well. GFRP reinforcement doesn't have any plastic zone. Therefore it fails immediately at the point of the maximum strength.

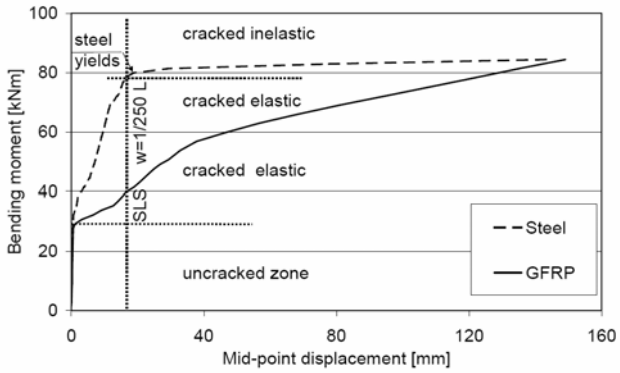

Figure 3. Stress-strain diagram of concrete member with steel and GFRP reinforcement

Big deformations can be observed in case of GFRP reinforced slab. This is mostly given by the low modulus of elasticity of GFRP. Applied load that touch the serviceability limit state (SLS) requirement is less than half of the ultimate load. To reduce deformation concrete slab would have to be over reinforced which is rather uneconomical. Furthermore not more than 40% from the high strength of GFRP is used.

Pre-stressing of GFRP utilize much more from the strength of GFRP and performs better behaviour in terms of deflection and crack development. GFRP bars have been pre-stressed up to 30% of its ultimate strength (650 MPa) according to the recommendations of the ACI (ACI 440.4R-03, 2003). That refers to the force of 30 kN in every tendon.

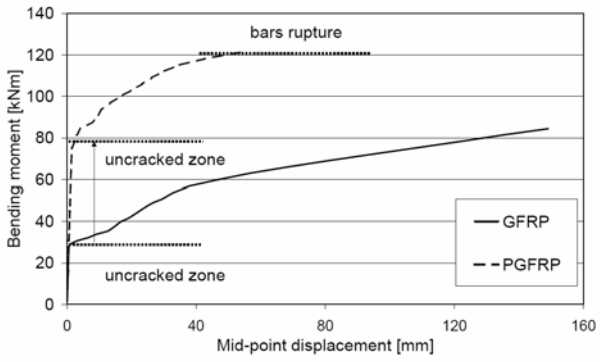

Figure 4. Stress-strain diagram of concrete member with steel reinforcement

SLS is now reached at the level of 83% from the ultimate load. Moreover ultimate load has in this case increased from 82kNm to 120kNm. Very good results have been gained

also in terms of cracks development. It can be seen from the figure 3 that un-cracked zone has shifted more that three times upwards.

Numerical reading has reached a very good correlation with experimental outcome. Correlation coefficient indicates strength of a linear relationship of two variables (Rektorys, 2000). Value of correlation coefficient reaches 0,0997050 which indicates very good conformity between experimental and numerical reading. The more correlation coefficient is closer to one the stronger relationship it is.

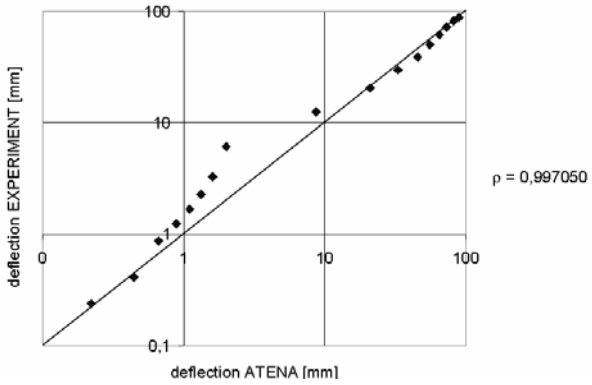

Figure 5. Correlation between numerical and experimental readings shown in logarithmic scale

Since the correlation coefficient proofed a very good conformity between virtual and real structure therefore it is possible to predict behaviour of concrete structures with another shape or even slightly different FRP reinforcement. Deflection, crack development and other structural properties can be indicated throughout the numerical reading nevertheless serious attention must be still paid on every step that has been done.

5 Conclusion and Further Research

High strength, low weight and corrosion proof ability are characteristics that point on the GFRP. On the other hand low elastic modulus determinate bigger deflections and earlier crack development. Pre-stressing enhance behaviour of concrete members with GFRP. Namely pre-stressing decreases deformations and therefore prevents early crack development. By pre-stressing the GFRP reinforcement is more utilized and therefore using of GFRP is more economic.

Basic behaviour of concrete members should help engineers and designers at their work. There is no guide for FRP in structures in the Czech Republic. Basic understanding of GFRP application in concrete prevents potentional problems and summarizes what to expect when dealing with GFRP as an internal reinforcement in concrete structures.

Numerical predictive model has been developed based on the experimental outcome in order to evaluate behaviour of other concrete members with different shapes or even slightly different FRP reinforcement.

Concrete structures for civil purposes are design generally for fifty years, bridges even for hundred. This research so far has shown how the concrete member behaves when loaded. Nevertheless what the concrete member does when loaded for more that year is another task which is a matter of future research. Therefore long time experiment focused on the permanently loaded elements as well as the high cycle fatigue test will be new tasks in the future in the field of fibre reinforced polymers.

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Environmental Impact of Stabilising Fluid in Slurry Method Applications of Bored Pile Excavation: A Proposed Methodology

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Abstract:
The environmental impact of the construction industry has been considered extensive and readily identifiable. One-tenth of the global economy is dedicated to construction, operating and equipping homes and offices. This activity accounts for roughly 40% of the materials flow entering the world economy. The current trend in rapid development requires further considerations for sustainability. Foundations are the most important part of a structure. In constructing foundations for large structures, in many cases, it is necessary to use stabilising fluid to prevent soil from collapsing during the excavation stage. The stabilising fluid, however, contains chemical that may be difficult to degrade and may result in negative effect towards the environment. Aiming to further investigate the most economical and environmental friendly treatment for stabilising fluid, a research agenda has been set and discussed. A preliminary literature synthesis is discussed in here and a methodology to conduct the investigation is presented here.

Keywords:
Bentonite, slurry, stabilising fluid, sustainability, recycling

1 Introduction

The environmental impact of the construction industry has been considered extensive and readily identifiable. One-tenth of the global economy is dedicated to construction, operating and equipping homes and offices. This activity accounts for roughly 40% of the materials flow entering the world economy (Hartlen, 2005). The trend for rapid and expansive development in the current world scenario has initiated concerns in terms of sustainable development. Common definition for sustainable development, which was formulated by the World Commission on Environment and Development (Brundtland, 1987) states that sustainable development should meet the needs of the present without compromising the ability of future generation to meet their own needs. The underlying philosophy of environmental sustainability concerns with leaving the earth in as good or better shape for future generations. By definition, human activity is only environmentally sustainable when it can be performed or maintained indefinitely without depleting natural resources or degrading the natural environment. The production and processing of manufacturing and construction materials impacts heavily on the landscape, and can cause air pollution, toxic runoff into watercourses, and loss of forests and agricultural land (Khalfan, 2002). The construction process and operation of buildings also account for 25 per cent of all timber use, 40 per cent of total energy use, and 16 per cent of total water withdrawals and generates enormous quantities of solid

waste. The industry's total annual output represents about 10 per cent (USD 300 billion) of the global GNP of which 30 per cent is in Europe (Khalfan, 2002). The industry is regarded as the world's largest industrial employer employing 28 per cent (111 million) of industrial employment.

During construction of a structure, there is need for foundations. Foundation of a building is commonly designed to transmit the load of structure to ground. Pile foundation transmit load to lower level of ground by combination of friction along their sides and end bearing at base. Bored piles are used when a soil replacement rather than a soil displacement method of piling is required and also when there is a need to minimize vibration. The best application is for cohesive soils. Piles can be produced by casting concrete in the void. When it can be difficult to maintain the integrity of the bored holes, owing to variability of the soil strata, a stabilising fluid is commonly used to fill the bored hole. This is known as the slurry method. The 'slurry', made of materials such as bentonite, supports the excavation by exerting hydrostatic pressure on wall of the bored holes, thus preventing the excavated to collapse. The stabilising fluids are normally removed after use and can be disposed, recycled or reused. In fact, most slurry materials can be dewatered to produce clear water and cake for disposal (Emmitt and Gorse, 2006).

The waste disposal ordinance 1990 prohibits the unauthorised disposal of wastes. Construction waste can be defined under 'Trade waste'. In case of disposal, used dewatered slurry should be disposed to a public filling area, and liquid slurry materials after mixed with inert fill material will be disposed to a public filling area or dumping ground. During an initial discussion with one of the piling practitioners of the UK construction industry, significant amount of used slurry materials (bentonite in this case) has been estimated requiring off- site disposal. It was also revealed the necessity of recycling the slurry materials as disposal requires a significant amount of time, efforts and money, thus drifting away from the current project management principles in construction. In light of this, an investigation has been set aiming to study the environmental impact of stabilising fluids and critically examine different alternatives, methods, criteria for minimising its negative effects to the site and environment in bored pile excavation. In order to achieve the aim, three objectives have been set as:

- To study current practice of using stabilising fluids in slurry method bored pile excavation
- Compare and evaluate the available alternatives for using the slurry method in bored pile excavation
- To establish and recommend the most environment friendly techniques in applying slurry methods in bored pile excavation

2 Literature Review

2.1 The Flow of Materials, Products and Waste in Construction

The following diagram in Figure 1 shows the flow of materials, products and waste for construction and demolition activities.

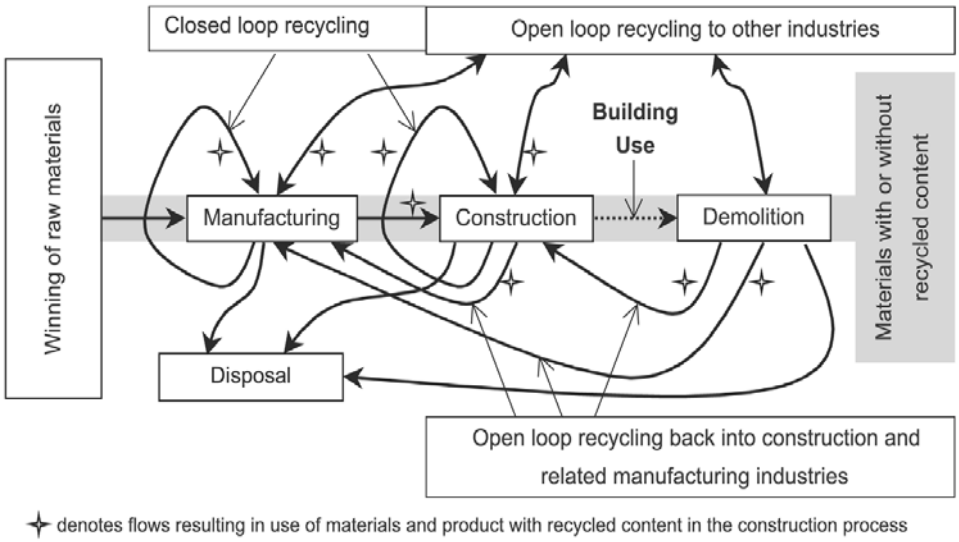

Figure 1. Flows of materials, products and wastes for construction and demolition activities (Source: Treloar *et al*., 2003)

The diagram indicated that material selection plays an important role. Closing material loop and eliminating solid, liquid and gaseous emissions are key sustainability issues in maintaining ecological and resources balance. It describes a process of keeping materials in productive use by reuse and recycling rather than disposing of them as waste at end of product or building life cycle. However, common materials involved in construction industry are not readily recyclable. Recycled industrial materials can loose viability or value in the process of recycling. This means they can only be used in a degraded form for components other than their original use. Therefore, in this investigation, the stabilising fluid post use usefulness to other industries will be highlighted. Reusing of the materials, such as structural steel sections in the construction industry for instance, will be beneficial in an unconstrained system. This, however, can change if constraints such as technical feasibility, limited deconstruction, and market appeal have a high effect. The complete production and consumption system has to be coordinated, including an improved communication between the various actors in the system, in order to utilize the potentials of reuse. It is recognised that construction stakeholders are reluctant to adopt low-waste disposal techniques, as they are expensive to use (Chen *et al*., 2002). There are various stabilising fluid materials. Bentonite, however, can be regarded one of the most popular. Guided by the aim and objectives set for this investigation, subsequent subsection will discuss stabilising fluid materials, focusing on bentonite.

2.2 Bentonite and other stabilising fluids

Bentonite is the name used for a range of clays that can expand and coagulate when dispersed in water. The term “bentonite” originates from the discovery of this type of clay near Fort Benton, USA, in the 19th Century. This was a natural sodium bentonite, and has been mined extensively for many years in Wyoming and Dakota for oil well drilling applications. Bentonite is now used extensively throughout the world in civil

engineering, whilst the cost of transporting original “Wyoming” bentonite from the USA has led to the use of alternatives from other sources. A large proportion of bentonite now used is therefore from other parts of the world (FPS, 2006). One of their main uses is to support the sides of panel excavations for diaphragm walls. In this application, the bentonite must be capable of forming a barrier or “filter cake” on the sides of the excavations to prevent loss of fluid into the ground and provide a surface layer against which the pressure of the fluid can act in order to resist external pressures from the soil and groundwater. Bentonite based stabilising fluids are also widely used in the construction of large diameter bored piles. This application is similar to that for diaphragm wall construction except for the shape of the excavation. Small diameter boreholes for site investigation work or other purposes are often bored through unstable strata using bentonite based stabilising fluid as an alternative to temporary casings. Another widely used application is in the construction of cut-off walls below ground to form barriers to groundwater or to surround areas of contaminated land. In this application, cement and/or other materials are added to the bentonite to form a ‘slurry’ which remains fluid for several hours before setting to form a relatively soft barrier wall. A thin flexible membrane is sometimes inserted into the slurry in the excavation before it sets (Prakash, 1990). Bentonite support fluids are also used in some cases to support the excavation face in front of tunnelling machines and to transport the cuttings to the equipment. The properties of bentonite from different sources vary, and it is important to understand that a property which may be required for one application may not be required for another. For example, gel strength is important if material has to be kept in suspension while the fluid is at rest, but may not be important if the fluid is agitated continuously in a circulatory system.

2.3 Bentonite slurry properties

Bentonite slurries of the type normally used to support excavations can vary widely in their physical and chemical properties. They must, however, perform the following functions:

(a) Support the excavation by exerting hydrostatic pressure on its walls

(b) Remain in the excavation, and not flow to any great extent into the soil

(c) Suspend detritus and prevent sludgy layers building up at the base of the excavation

In addition, they must allow:

(d) Clean displacement by concrete, with no significant interference with the bond between reinforcement and set concrete

(e) Cleaning to remove suspended detritus, by passing through screens and hydro cyclones, in preparation for re-use

(f) Easy pumping

In general, items (a) to (c) require thick, dense slurries, while items (d) to (f) need very fluid slurries. There are therefore conflicting requirements which must be resolved before an acceptable specification for slurry properties can be drawn up (Shah, 1980). In

the following statements, consideration is given to the effect of slurry properties on each function. This will help in the establishment of limits for most of the slurry properties and in defining slurry which is acceptable for each function and also for the overall excavation process. The primary aim of any bentonite slurry specification is commonly set to ensure that the slurry is capable of fulfilling functions (a) to (d) without deleterious effects on the finished pile, wall or other form of construction. In addition, for economic and environmental reasons, the maximum re-use and minimum disposal of used slurry are required.

All soil strata have the property of attaining charges on it. They have both the charges acting on it as positive or negative. Negative charge is found on flat soil condition whereas positive on recently exposed sites (sharper points, and so on.). Bentonite is noted for its affinity for water and for tremendous swelling properties. It can be described as a bundled plate structure, the surface of which is populated by sodium ions. The addition of water causes the sodium ion to hydrate, generating a negative charge on the bentonite plate. Since like electric charges repel each other the platelets are moved apart causing a phenomenon called "swelling". The rate of swelling depends upon the fineness, grade and how the bentonite is handled. All grades expand very slowly when water is poured on them, much faster when they are poured into water.

2.4 The effect of slurry properties on required uses

In order to exert stabilising pressure on permeable walls of an excavation, bentonite slurry must form a seal on or near the surface of the soil. This avoids loss of slurry into the soil, with consequent increase in pore pressure and reduction in shear strength, and enables the slurry to exert its maximum stabilising effect (Prakash, 1990). When bentonite slurry is being prepared, the objective is to achieve maximum hydration of the bentonite. Potable quality fresh water from a mains supply should be used in the mixing process to achieve the best results. If there is any doubt about the quality of the water, a chemical analysis should be carried out to determine its suitability or the need for chemical treatment before use. Water containing high degree of salt should not be used in the preparation of bentonite slurry due to the lack of simple chemical treatment available to remove the sodium chloride. The presence of calcium or magnesium in fresh water will inhibit dispersion of the bentonite powder, but it is a relatively simple matter to treat these chemically before the water is used. Calcium can be removed by sodium carbonate (Na_2CO_3) which precipitates out the calcium as calcium carbonate. Care must be taken not to over-treat the water, since this will provide an excess of carbonate ions which will hinder hydration. Magnesium can be treated with caustic soda (sodium hydroxide) which can also be used to provide some alkalinity to help in dispersing the bentonite when it is mixed (Emmitt and Gorse, 2006). Bentonite slurry can be prepared either in batches or in a continuous process, depending on the type of equipment used. Bentonite in a dry form (powder) must be added to the mixing water gradually in order to ensure that all the particles are wetted and do not clump into partially hydrated balls. Typically, the bentonite powder is added through a simple venture-hopper or directly into a high shear mixer. The mixing equipment must generate sufficient shear to ensure that all the individual bentonite particles are dispersed in the mixing water. The quantity of bentonite powder to be added to the mixing water depends on the quality of the bentonite and the required viscosity of the slurry. For most

applications, concentrations between 4% and 6% by weight are typical (Emmitt and Gorse, 2006).

While excavating using bentonite as a stabilising fluid, fine soil particles will accumulate in the slurry. If this material is kept in suspension to prevent the formation of a layer of sediment at the base of a pile bore, the bentonite slurry should have a high viscosity under quiescent conditions. A measure of this can be obtained from the 10 minute gel strength which can be determined when testing the rheological properties of the slurry, or other testing method for gel strength (Baligh and Levadoux, 1990). Soil-bentonite cutoff walls are constructed using the slurry-trenching technique. A vertical trench is excavated in the ground with slurry (usually bentonite-water slurry) in the trench to support the excavation. A base soil (either the excavated material from the trench or material from off-site) is mixed with bentonite in the form of bentonite-water slurry, and perhaps in dry form also, to create a low-permeability backfill mixture called soil-bentonite. Finally low-permeability backfill is placed in the trench and displaces the lighter support slurry to form the cut-off wall.

3 Research Methodology

Research Methodology refers to the principles and procedures of logical thought processes which are applied to a scientific investigation (Fellows and Liu, 1997). The research methodology proposed to achieve the aims and objectives of this investigation can be chronologically grouped into five different stages as follows.

3.1 Stage 1 Preliminary interview with practitioners

The initial stage of data collection method was facilitated by an informal discussion with relevant construction practitioners based in the UK. At the moment of writing this paper, this stage has been completed. Key informants provided supplementary data which confirmed the need for further research in the matter. Interview guides indicated various degrees of structures to the interviews, even though interviews have been generally treated as conversations during which the interviewer drew out detailed information and comments from the respondents. One way to provide a certain degree of structure (i.e. not completely unstructured) whilst maintaining informal conversation with a relatively high degree of flexibility to elaborate discussion is by implementing semi-structured interview with semi open question (Naoum, 2007). Therefore, this investigation adapted semi-structured interview for this stage.

3.2 Stage 2 Literature synthesis

A comprehensive review of the relevant literature has been undertaken and will continuously be conducted over the course of this research) in order to develop an understanding of previous work in piling works in construction industry and the use of stabilising fluids and its environmental impact. Several journals based on piling engineering and sustainable development have been and will be included throughout the investigation. Technical reports and occasional papers can be of great use as they are synoptic and often publish up to date information. Moreover, occasional papers and reports of certain research groups are sufficiently prestigious for the researchers concerned to favour them as a method of broadcasting their results (Robson, 2000). The

purpose of this literature synthesis is to continuously inform and review the research on use of stabilising fluid keeping in view financial, environmental and usability aspects.

3.3 Stage 3 Pilot Questionnaire and Analysis

Pilot questionnaires were circulated to relevant civil engineering professionals (members of professional institution relevant to civil engineering) in order to develop a better understanding of carrying out the slurry method in practice. Pilot questionnaires were distributed in order to refine problems to achieve the objectives of the dissertation. Questionnaires may be unsuccessful in the case participants fail to understand the objectives and the questions, unable to complete the questionnaire due to time constraints, get bored or offended by them, or simply put off by the poor presentation of the whole package. It has been considered a common practice for researcher to start with qualitative data collection and analysis on a relatively unexplored topic then using the results to design a subsequent quantitative phase of the study (Tashakkori and Teddlie, 1998). The basic approach to be followed in this investigation is to ensure all unnecessary, difficult or ambiguous questions will not be included whilst each question should give an adequate range of responses, to establish that replies can be interpreted in terms of the information that is required and to check that all questions are completely and correctly answered (Robson, 2000). The analysis of pilot questionnaire will be in two forms, first to determine the level of agreement or disagreement by the respondents to each question within the pilot questionnaire and secondly to critically evaluate each of the objectives of the investigation with the procedures followed in each of the respondent knowledge. In conducting evaluations, quantitative methods are best suited to measuring levels and changes in impacts and to drawing inferences from observed results between those impacts and other variables (Robson, 2000).

3.4 Stage 4 Interviews

Qualitative methods afford a means of providing distinct data and evaluation of theorising problems and approaches (McKie, 2002) with interviewing perceived as the ‘gold standard’ of qualitative research (Silvermann, 2000; Mason, 2002). Interviews are planned to verify and further elaborate the questionnaire result. A face to face role situation in which questions designed to elicit answers will be asked. The questions, their wording and their sequence define the structure of the interview (Nachmias and Nachmias, 1996). The invitation to further involve in the investigation will be indicated in the pilot questionnaire. Respondents of the pilot questionnaire interested to further contribute to the investigation will be interviewed. Semi- structured interviews with semi open questions will be conducted to further discuss the matters being investigated. At the moment of writing this paper, it is envisaged to further discuss the techniques used to recycle used bentonite, advantages and disadvantages of the techniques including the financial considerations and environmental impact. However, issues to be discussed will mainly be determined by the outcome of the pilot questionnaires. It is also targeted to have at least six interviews. In the case of less than six pilot survey agreed to be interviewed, new respondents will be contacted to achieve six interviews in order to provide a sufficient breadth of information to perform the subsequent stage, i.e. the data analysis.

3.5 Stage 5 Interview Analysis and Finalisation of Findings

Output end of analysis can be critical in the case that the investigation is seeking knowledge about a firmly defined question. On all fields of science the existing system of knowledge – theory is arranged as a consistent logical pattern and new findings of research are expected to fit in this existing framework. Typical such patterns are descriptions of objects or phenomena, explanations of processes, and predictions on the future behavior of the object of study (Naoum, 2007). Even though the main approach to analysis in this investigation can be considered qualitative, quantitative approach was considered necessary (i.e. the pilot questionnaire). Quantitative data is not abstract, they are hard and reliable; they are measurements of tangible, countable, sensate features of the world (Naoum, 2007). Researchers often conduct exploratory research to diagnose a situation, screening alternatives and to discover new ideas (Naoum, 2007). Qualitative (from interview) and quantitative (from questionnaire) data sets can be linked, preserving the numbers and words in each data set. Linking the results of qualitative and quantitative analysis techniques will be accomplished by treating each data set with the techniques usually used with that data; that is, qualitative techniques will be used to analyse qualitative data and quantitative techniques will be used to analyse quantitative data. The results of the qualitative analysis of interviews and of the quantitative analysis of quantitative data will then be combined at the interpretive level of this research.

At the moment of writing this paper, the final findings of this stage are expected to enable the researcher to recommend the most economical and environmental friendly ways of treating used bentonite. Alternative materials and/or alternative ways of stabilising bored holes for bored piles purpose using novel and innovative technology may also be identified and discussed. The overall research methodology of this investigation is presented in Figure 2.

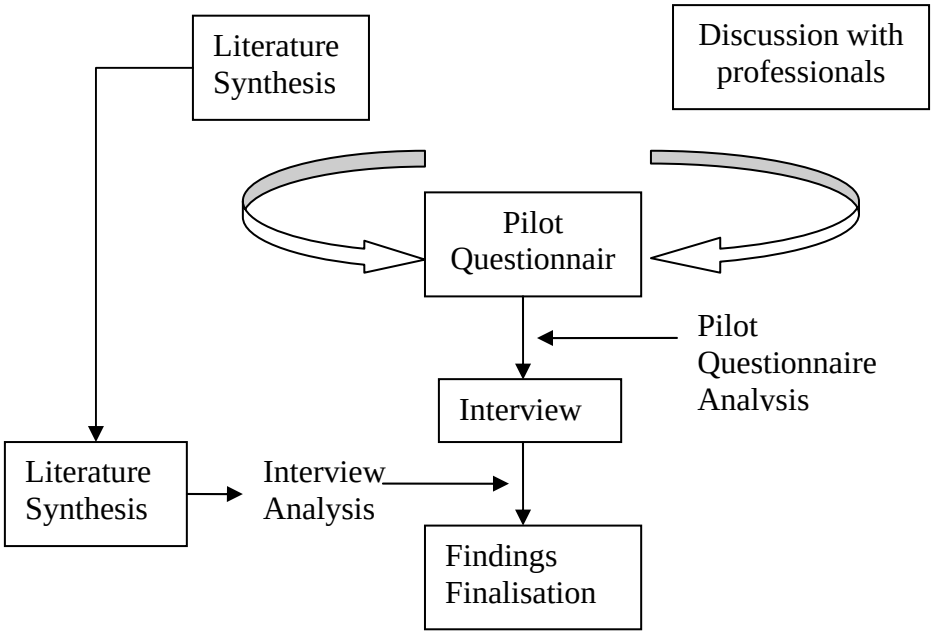

Figure 2. The Proposed Research Methodology

4 Conclusion and Further Research

Construction industry has been considered one of the industries that produce a significant amount of waste. From various activities within construction, foundation can be considered the main feature of constructing a structure. For larger structures, bored piles foundation is a common choice due to its capability to transfer loads to stronger soil strata. The use of stabilising fluid is a common approach in drilling for bored piles excavation. The stabilising fluid can be directly disposed, treated, or recycled. In an attempt to improve the situation, an investigation has been set to study the treatment of stabilising fluid for foundations excavation, particularly for bored pile construction. The investigation was started by an initial interview with a number of construction professional as well as conducting a thorough literature review on relevant disciplines starting from material waste of construction in general, the use of stabilising fluid in bored piles construction, financial and environmental impacts, and potential techniques to treat the stabilising fluid with minimum financial and environmental impact.

The overall methodology to perform this investigation has been proposed and discussed in this paper. Further research involve conducting further literature review on relevant matters, designing pilot questionnaire to verify the research problems and give direction for further literature review and in conducting the main data collection, i.e. interview with at least six construction professional in order to achieve the aim and objectives of this research.

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