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Shaping the Construction/Society Nexus: Volume 1

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– Shaping the Construction/Society Nexus

Volume 1: Clients and Users

Danish Building Research Institute
AALBORG UNIVERSITY

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Kim Haugbølle, Stefan Christoffer Gottlieb, Kalle E. Kähkönen,
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Organising Committee’s declaration:
All the papers in these proceedings were double-blind refereed at abstract and full paper stage by members of the scientific committee. This process involved, detailed reading of the abstracts and papers, reporting of comments to authors, modifications of papers by authors and re-evaluation of re-submitted papers to ensure quality of content.

FOREWORD

On behalf of the Organising Committee, it is my pleasure to welcome you to Copenhagen and the Conference Centre of the Danish Association of Engineers for the 6th Nordic Conference on Construction Economics and Organisation.

When we commenced with the planning of the this year's conference, we had great hopes and expectations to be able to invite you to the largest Nordic Conference on Construction Economics and Organisation yet, along with a number of associated events, and with papers of high scientific rigour and quality – and we are pleased to announce that our expectations have been fulfilled.

Focusing on the nexus between construction and the built environment, we invited papers that would explore the various ways in which construction and the use of constructions are interlinked and mutually constituting and transforming each other. We received more than 150 abstracts, which through a double-blind peer review process resulted in 56 papers being published here in these proceedings under the theme: "Shaping the construction/society nexus." The published papers are of a high quality and display a growing tendency with our field of research: namely the application of theoretically informed approaches to raise the quality of the analyses and the generalisation of conclusions.

The road to the conference has, however, been long and arduous, which has presented organisers, committee members, reviewers and authors with a series of minor and major technical and organisational issues. We apologise and are at the same time confident that these sorts of problems will be a thing of the past when the 7th Nordic Conference on Construction Economics and Organisation will be held in 2013.

Thus, in the two years until the next conference, we will work hard to establish a more professional or at least a more permanent, organisation behind the conference series by forming a network for Construction Researchers on Economics and Organisation in the Nordic region. We have already taken the first step by signing a Memorandum of Understanding with our friends in both ARCOM and CIB who have cordially helped us promote this year's conference. It is our hope that we in the years to come will be able to return the favour and help develop the field of construction management for the benefit of all of us.

An event like this is only possible with the help of many individuals and organisations. First and foremost, I wish to thank the members of the Organising Committee and in particular Stefan Christoffer Gottlieb and Göran Lindahl. Further, I would like to thank all members of the Scientific Committee, who have helped us maintain a high standard and quality of papers. Finally, I would like to thank our partners and sponsors for their collaborative contributions and financial support.

I wish you a pleasant and profitable conference.

Kim Haugbølle
6th Nordic Conference Chair
Danish Building Research Institute, Aalborg University

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RE-THINKING STAKEHOLDER MANAGEMENT IN CONSTRUCTION: THEORY & RESEARCH

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From its roots in strategic management theory, stakeholder management has been adopted by the construction management academic community and applied as a valid paradigm around which research work has been generated aiming to improve project efficiencies and effectiveness. However, academics have argued that stakeholder management should move away from purely theoretical discussions and engage more with the realities of construction project work. This paper re-appraises the stakeholder management concept for the construction domain by re-thinking some of the fundamental principles and ideals present within the more general stakeholder theory literature. It engages with issues which researchers have arguably failed to acknowledge and calls for a re-evaluation of construction stakeholder management research by presenting a review around four distinctive themes: the moral obligations of engaging with stakeholders against the business and efficiency driven imperatives of construction organisations; the contrast between theoretical abstractions and empirically grounded research; the tensions between theoretical convergence versus calls for multiple and divergent perspectives on stakeholder management and the practicalities of conducting stakeholder management in the construction domain. Such a critical re-appraisal of stakeholder management thinking both generates new lines of enquiry and promises to help inform and shape current and future industry practice.

KEYWORDS: stakeholder; stakeholder management; corporate social responsibility; research agenda; stakeholder theory

INTRODUCTION

From its origins and roots in the field of business & strategic management theory (Freeman, 1984), the stakeholder management concept has been embraced by construction management academics as a valid and valuable theoretical paradigm to apply in construction project contexts. Stakeholder management is now considered a key concept for the completion of construction project work (Atkin & Skitmore, 2008). This is evidenced by the number of academic publications generated under the "stakeholder management" banner. These publications range in subject-matter from practical advice papers for stakeholder engagement (Chinyio & Akintoye, 2008), guidelines and methodologies on how best to approach the subject (Fraser & Zhu, 2008), conceptual model exploration (Rowlinson & Cheung, 2008), practical tools for utilisation (Walker et al., 2008) and strategic needs analysis (Smith et al., 2001). Often supported by empirical evidence from case studies (e.g. Olander & Landin, 2008), the stakeholder management concept now embraces issues such as risk and uncertainty reduction on projects, sustainability, ethics and relationship management. In the process, stakeholder management has become almost a touchstone of reference for construction management researchers. However, in order for academic discourse to mature

effectively, it is often prudent to reflect and re-consider the applicability (or not) of certain mantras. As Green and Simister state,

"The construction industry has a tendency to adopt the latest management fashion in the hope of finding quick solutions to long term problems. It is the responsibility of the academic community to adopt a more critical stance, and to ensure that new fads are evaluated in the light of established theoretical frameworks." (1999, p.64).

A similarly precautionary note has been voiced by Chinyio & Olomolaiye in a recent book concerning construction stakeholder management,

"Although principles can be adopted across boundaries, construction has its peculiarity, hence the need to evolve principles of construction stakeholder management based on empirical research." (2010, p.8).

This paper re-appraises research in the construction stakeholder management field by re-engaging with some of the fundamental principles and ideals present within the more general stakeholder theory literature. It begins to engage with issues which construction management researchers have arguably failed to acknowledge or simply presumed or assumed to be true and calls for a re-evaluation of construction stakeholder management research practices and ideas. This is done by presenting a review based around four distinctive themes from the general stakeholder management literature: the moral obligations of engaging with stakeholders against the business and efficiency driven imperatives of construction organisations; the contrast between theoretically orientated abstractions and empirically grounded research in engaging with construction stakeholders; the tensions between theoretical convergence versus calls for multiple, contextualised and divergent perspectives on stakeholder management and the practical implications of conducting stakeholder management in the construction domain. Such a critical re-appraisal of construction stakeholder management thinking both generates new lines of enquiry and promises to help inform and shape current and future industry practice.

Stakeholder management theory

The evolution of the stakeholder management concept is traditionally attributed to Freeman (1984), whose discussions of the idea were firmly rooted in the strategic management and business field. Other scholars since Freeman have further clarified the definition of a stakeholder, so that stakeholders are now commonly viewed as any individuals or groups of persons with a direct interest in a project or enterprise. Carroll provides a succinct definition of stakeholders as,

"those groups or individuals with whom the organisation interacts or has interdependencies… any individual or group who can affect or is affected by the actions, decisions, policies, practices or goals of the organisation." (1993, p.62).

The validity of the stakeholder management concept for business was underlined by Savage et al., (1991), where effective stakeholder management by a "strategic" manager was identified as a way of obtaining corporate effectiveness (and profitability) through analysis of the benefits and threats posed by stakeholders when a course of action was being decided upon. Although stakeholder theory may not give primacy to one stakeholder group over another, in practice, companies are arguably more concerned about efficiencies, effectiveness and profitability, and in such an analysis, the claims of some such stakeholders (e.g. investors) will be more important than others. Partiality (as opposed to impartiality) may be a

natural, indeed necessary, characteristic of stakeholder management in order that the competing claims of stakeholders may be effectively assessed and managed (Gisbon, 2000).

Academic discourse on stakeholder theory has continued. For example, Friedman & Miles (2002) acknowledged that the complexity of stakeholder and organizational relations makes sweeping theoretical propositions difficult to support. They noted that existing stakeholder management theories often omit to recognise fundamental facts of business life: that pragmatic forces operating in the corporate world which affect stakeholder relations should be recognised and the boundaries between different stakeholders may be blurred and be unstable. Additionally, the dynamics of stakeholder and organizational relations is often over-simplified and stakeholder "types" are seldom distinguished in the literature.

Whilst Jones & Wicks (1999) have proposed convergent stakeholder theory as a fresh theoretical approach, Freeman (1999, p.233) dismissed their convergent stakeholder theory as unsound,

"We do not need more theory that converges but more narratives that are divergent – that show us different but useful ways to understand organizations in stakeholder terms."

Similarly, Trevino & Weaver (1999) have argued against the idea of converging theories together. They called for further empirical research to be done in order to advance the evidential base of stakeholder management theories and to add credence to the stakeholder research tradition. This call for more narratives and empirical research work from the strategic management field chimes well with recent comments from the CME (construction management & engineering) academic community.

Construction stakeholder management

The stakeholder management concept appears to have been widely accepted by the CME academic community as a valid and useful paradigm. A 2008 special issue of Construction Management & Economics was devoted to the subject and publications continue to appear on the subject every year. It is clear from this academic output that stakeholder management is viewed by many as important for construction industry work, as vital as other areas of activity such as briefing, sub-contracting and facilities management. However, the CME literature is littered with many questionable assumptions and curious propositions which are often based upon insecure theoretical foundations. These potential flaws in the subject are perhaps reflected by a distinct lack of unification amongst construction professionals with regards to which strategies, methodologies and processes to adopt with regards to construction stakeholder management.

Stakeholder management is rooted in strategic management theory and this is often evident in the CME literature. In quoting Cleland (2002) for a definition of stakeholder management, Chinyio & Olomolaiye (2010) position themselves firmly within the field of strategic business management theory. Their introductory chapter is littered with quotations from strategic management theory authors which remain unsupported with empirical research evidence from real construction projects. For example, "an organisation may sometimes have to trade-off the needs of one stakeholder against another" (Thompson, 2002); "when the differing expectations of stakeholders cannot be achieved at the same time, compromises become worthwhile" (Johnson et al., 2005) and "as stakes are not static but dynamic, there is a need to manage the constantly shifting balance between the interests of stakeholders" (Goodijk, 2003). These observations may be valid and difficult to refute, but they come from strategic management scholars and are not supported by any evidence from the construction industry domain. Chinyio & Olomolaiye (2010) also note that not all researchers agree on

the importance of stakeholders, and that stakeholder theory itself has been criticized on both theoretical and empirical grounds.

The majority of CME research papers on stakeholder management have chosen to focus on practical aspects of the subject (e.g. tool formulation, advice for project managers, stakeholder identification & categorization) rather than explore underlying theory to justify the stakeholder concept. Whilst the merits of publishing more practical papers for industry consumption is obvious, the danger of not having a strong theoretical foundation could result in papers disjointed from the realities of construction project work. Atkin & Skitmore (2008) have observed that the heated debate between academics over correct definitions and attaining a conceptual consensus on stakeholder management had detracted from more beneficial and useful exploratory work into the concept: their call for further exploratory work reinforces the argument that construction stakeholder management needs a stronger theoretical basis in order to produce practical papers which have more validity.

These initial observations of the CME stakeholder management literature provide a contextual background for reviewing the literature further. It is clear that uniformity and consensus of opinion amongst researchers has yet to be attained: there is no universally accepted way of achieving successful stakeholder management; there is no one method, tool or idea to employ to make it happen; indeed, there may be theoretical problems where construction stakeholder management is concerned. The CME stakeholder management literature may be objectively critiqued by orientating a review around themes identified in the general stakeholder management literature. Using this approach, it is evident that tensions pivot around several themes: the moral obligation of companies to engage with stakeholders against their business and efficiency driven imperatives (Gibson, 2000); the contrast between theoretically orientated abstractions and empirically grounded research in engaging with stakeholders (Friedman & Miles, 2002); the tensions between theoretical convergence versus calls for multiple, contextualized and divergent perspectives on stakeholder management (Freeman, 1999) and the practical implications of conducting stakeholder management (Trevino & Weaver, 1999). The CME literature will now be reviewed using these distinctive themes, highlighting important questions and issues as the discussion progresses.

Moral obligations versus business imperatives

That construction companies have moral and ethical obligations to their stakeholders has been recognised, but both the nature of this moral responsibility and how it translates into actions and corporate behaviour is less well defined. Clearly, when an organisation has power, it has a responsibility to use that power fairly and equitably (i.e. with power comes responsibility, Smyth (2008). But in a construction context, morality and ethical responsibility may be less well defined than in other business sectors. For example, the concept of corporate social responsibility (Crowther, 2008) is very real in the clothing and food retail business (i.e. use of cheap labour; fair-trade coffee; dolphin-friendly tuna, etc.). But do ethical and moral issues drive construction company decisions to a similar extent? Certainly, moral and ethical issues are now theoretically recognised in the sustainability agenda, but the extent to which they drive business decisions (and stakeholder management) is unclear. In reality, are moral obligations judged to be more important than the hard-nosed business imperatives of finishing a project on time, within budget? Indeed, are economic targets themselves ultimately moral and ethical in essence?

In truth, the moral dimension of stakeholder interactions (i.e. that stakeholders both internal and external to a project will have complex ethical perspectives on a project) has too often not been adequately addressed by CME researchers. Smyth (2008) comments that many

CME academics have failed to recognise that stakeholders external to a project have more concerns than pure profit and gain from a building enterprise. Similarly, Moodley et al. (2008) rightfully recognise the need to account for stakeholder ethical and moral concerns around construction projects. Both Smyth (2008) and Moodley et al. (2008) propose their own methodologies for engaging with the morality concept, but these ideas are more theoretical than practical because they are not rooted in exhaustive empirical testing. The admission of Moodley et al. (2008, p.630) that, "the values and value system of the matrix owner will determine which ethical issues to include", suggests their matrix may be flawed because the stakeholders themselves are not divulging their ethical and moral concerns about a construction project. However, these works are arguably a positive move towards the creation of more intuitive models of stakeholder assessment. Smyth (2008) himself argues for a move away from approaches underpinned by skewed utility and from self-interested power-based analysis, embodied by such devices as "power/interest-level" matrices: morality-informed assessment methods of stakeholder management would be more sophisticated in this respect. Yet, the difficulty of finding the "moral compass" of any stakeholder is significant: assigning values to such ideas in numerical or graphical terms even more problematic (especially if estimations are done by external parties).

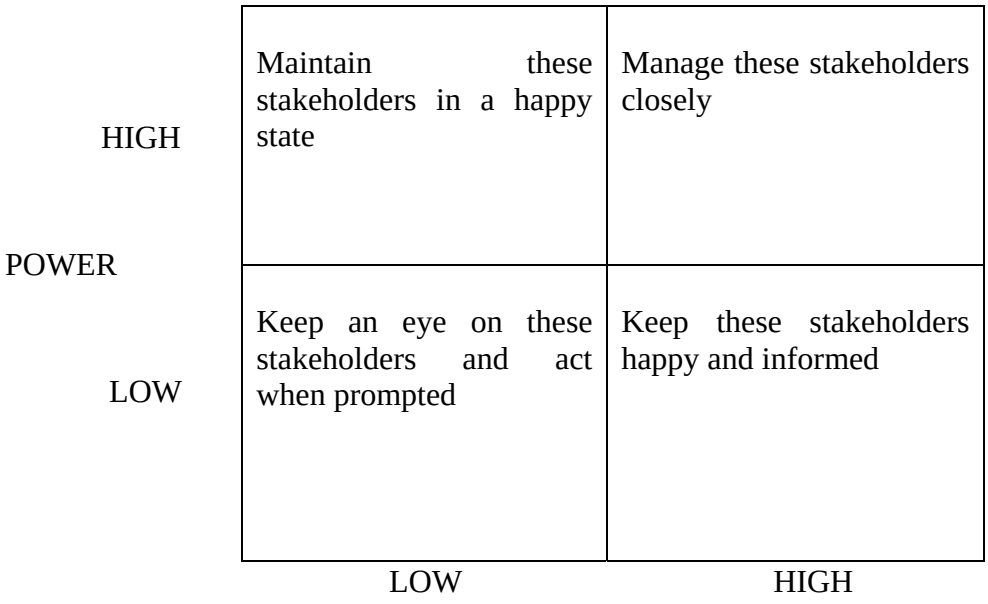
Therefore, whilst the ethical and moral concerns of stakeholders are significant issues, how best to obtain, assess and then act on them is a more difficult subject to grapple with. Understanding and acknowledging the moral-stance of stakeholders is a not insignificant concept for construction project success, but there are potentially real tensions for construction companies in balancing business imperatives with moral obligations to stakeholders. The CME academic output on stakeholder management has largely failed to engage with how organisations balance their "moral" obligations to stakeholders with their "business" imperatives: in this respect, further research work could attempt to re-dress the imbalance.

Theoretical abstractions & empirically-grounded research

There is a clear demarcation between theoretical abstractions regarding stakeholder management in construction and empirically-grounded research work in the field. It has been noted that stakeholder management originated in strategic management thinking, and that its adoption by the CME academic community has been largely unchallenged. It could be argued that much of the CME stakeholder management literature has little empirical-grounding, being fundamentally theoretical in nature: this is evidenced by academic publications which arguably too easily borrow phrases from the strategic management literature and which argue for the use of tools and methodologies with little empirical foundation.

Newcombe (2003), for example, argued that the concept of the client had been replaced by that of project stakeholders and argued for the importance of stakeholder mapping for project success. He proposed the use of several 4-box matrices to allow the "power", "predictability" and "interest-level" of key project stakeholders to be mapped and surveyed by project managers. Such 4-box grids have appeared regularly in the CME literature (c.f. Newcombe, 2003; Chinyio & Akintoye, 2008; Olander, 2007). A typical example is given in Figure 1.

Figure 1: A power-interest matrix. Source: Chinyio & Olomolaiye (2010: 89).



The mapping of project stakeholders using concepts such as "power", "predictability" and "interest-level" is problematic. Initially, a project manager may be poorly qualified to judge a stakeholder entity in such terms. Such an assessment may be biased, ill-informed and skewed by other events. Additionally, how can such concepts as "power" and "interest-level" be objectively quantified? Is stakeholder "power" their financial muscle, their legal authority or a matter of personality? Concepts of "power" and "interest" in such tools are arguably too simplistic: the nature and manifestation of "power" is unclear; the ethical and motivational influences behind "interest" are unacknowledged and unexplained. Smyth (2008) expressed concern over the use of such devices, stating that there is a serious credibility gap between stakeholder theory and many of the practical methodologies and strategies proposed in the AEC literature. Such tools are skewed towards organizational and project self-interest: creating profit and growth through meeting project objectives. A more fundamental problem with such matrices is a lack of empirical effectiveness: an absence of applied, rigorous testing counts against their effectiveness on real projects. On the few occasions when they have been tested (e.g. the stakeholder impact index of Olander, (2007), they suffer from not being utilized and applied for sustained periods of time. However, in this case, the author notes that further research is needed to examine and evaluate the application of the tool, reinforcing the point that further work often needs to be done in order to strengthen the validity of conceptual models. Such practical questions often arise from research work offering tools for utilization.

A recurring issue with some of the CME literature is the use of terms or concepts which are difficult to substantiate. The concepts of stakeholder "power", "interest-level" and "predictability" have already been mentioned. Nguyen et al. (2009) list many such concepts as being significant for stakeholder assessment work (*power, legitimacy, urgency, proximity, vested interest, attitude, knowledge*) and through assignment of numeric values (and calculations via formulae), develop a stakeholder impact analysis based on these concepts.

Whilst it is hard to argue against the validity of such concepts, using them practically via numeric valuation techniques raises more difficult questions. Bourne & Weaver (2010) have rightly expressed concern over the use of such concepts because the judgements used to assess them are usually personal in nature (e.g. by a project manager) and therefore, can never be truly objective.

Research work which engages with stakeholders on real construction projects is more valuable than theoretical and conceptual work removed from construction project contexts. Olander & Landin (2008) provide case-study reviews of 2 railway projects from Sweden. The authors present informed insights from the case study investigations and detail techniques and tools used for achieving success whilst presenting the serious negative consequences of poor stakeholder interaction. Such work is arguably more valuable than theoretical works with little validation from industrial application. It is therefore observable from a brief review how the literature can be divided between research papers offering more theoretical abstractions concerning stakeholder management (e.g. the use of woolly conceptual abstractions) and those with a firmer empirical foundation, where case-study evidence supports academic arguments.

Theoretical convergence or divergent & multiple narratives?

The tendency amongst CME academics towards theoretical convergence and simplification is evident when different aspects of construction stakeholder management scholarly work are examined. Dissatisfaction with this research output gives credence to the call for more multiple narratives and divergent perspectives on effective stakeholder management from different construction project contexts (Chinyio & Olomolaiye, 2010). Construction stakeholder identification and categorization is a case in point. Both Leung & Olomolaiye (2010) and Olander & Landin (2008) categorize stakeholders as being either internal (clients; consultants; contractors) or external (external public parties; external private parties) to a project. Academics have also categorized stakeholders in other ways, for example as direct/indirect stakeholders, contracted/non-contracted stakeholders (Smith & Love, 2004) or as supportive, neutral or anti-stakeholders (Chinyio & Akintoye, 2008). Whilst it may be possible to classify or categorize stakeholders in such ways, employing a typology method can be problematic. Chinyio & Olomolaiye (2010) state, "given the several dimensions on which stakeholders can be interpreted, some stakeholders may be members of two or more types." They suggest a "multidimensional plot" to capture the full complexity of stakeholders and their often large number but do not elaborate on how that is to be achieved. In the context of a construction project, more sophisticated and specialized methods of stakeholder identification and categorization may be beneficial: stakeholders are complex entities and categorizing them under broad headings may serve little purpose.

Stakeholders are commonly viewed as a source of risk and uncertainty for projects. Papers such as that of Ward and Chapman (2008), attempt to tackle the risk factor through framework generation: the authors present a project uncertainty management process framework to provide a structure for reviewing approaches to analyse stakeholders and related uncertainty management issues. Similarly, Leung & Olomolaiye (2010) propose that a systematic risk-assessment process be followed, preceded by a categorisation of stakeholders into internal and external groupings. However, the authors provide no case-study evidence to strengthen their argument for the use of these ideas in the real world. These academic explorations would benefit from applied application in different construction project contexts as it is reasonable to assume that different construction projects will possess their own individual risk & uncertainty characteristics. Therefore, attempting to create pan-industry solutions may not be the way forward.

Academics have also combined stakeholder management work with important emerging themes such as sustainability. For example, Rowlinson & Cheung (2008) presented a conceptual stakeholder management model based upon the ideas of empowerment, relationship management and sustainability ideals. They compared study evidence from Hong Kong and Australia to argue their points and look at relationship management, stakeholder management and the empowerment factors evident in their case studies. However, sustainability itself is a complex and difficult concept upon which to attain consensus amongst project participants: the academic community has yet to reach agreement on the optimum method of achieving this in a construction project context. As Mathur et al. (2008, p.605) state,

"If it is accepted that sustainable development cannot be defined in an objective manner and value judgements exist, then, by implication, the exact interpretation of sustainable development should be determined in the context of each project, its particular characteristics and stakeholders"

These reflections suggest that CME research in this field might move away from attempts at theoretical convergence towards more multiple, divergent narratives of what constitutes stakeholder management in different sectors and in different construction project scenarios. For example, little research has been conducted to examine the utility and effectiveness of different stakeholder management methodologies and techniques employed at different stages of a construction project in different project sectors (e.g. health, retail, housing). Divergent narratives such as these (although much more focused) do hold the potential to yield more valuable data than generalist theories. Stakeholder management is a complex concept and it may often be tempting for scholars to engage in over-simplification and theoretical convergence in order to reach compelling arguments. However, the complexity of stakeholder interactions suggests that further applied research work, which is more divergent and sector specific, needs to take place in order to advance understanding of the issues involved.

Practical implications of conducting stakeholder management in construction domain

The issues, practicalities and potential difficulties of adopting a comprehensive stakeholder management strategy has seldom been explored by researchers in the field. Indeed, the practical implications of using stakeholder management techniques are considerable and should not be dismissed as insignificant. Yet much of the academic literature does not engage with this issue at all: there are frequent assumptions, presumptions and omissions about the subject. For example, effective stakeholder management requires commitment (in time and resources) from an organisation: this fact is seldom acknowledged in the literature. Additionally, there are many assumptions concerning the implementation of stakeholder management. It is commonly assumed that the project manager is best qualified to organise and co-ordinate the stakeholder management work (c.f. Chinyio & Akintoye, 2008; Walker et al., 2008; Newcombe, 2003). However, such an assumption should be challenged. A project manager will have personal ideas regarding stakeholder management and these will affect how the concept is engaged with. Additionally, does the project manager have enough time to perform stakeholder management tasks and are they qualified or experienced enough to do the work? Furthermore, if stakeholder mapping should extend beyond the construction phase of a project (as Chinyio & Olomolaiye (2010) state), who will undertake stakeholder management work once a project manager is no longer on the scene? The role of different construction professions with regards to effective stakeholder management on a project needs further applied investigative work.

The nature of construction projects also needs to be recognised by stakeholder management scholars. Construction today operates in a globalized marketplace with many projects being international collaborative endeavours between companies with different cultural, ethical and moral ideas about how to conduct business. Obtaining consensus amongst project actors on stakeholder management strategies and methodologies to employ may be difficult (if feasible at all). Moodley et al. (2008) highlights the need for obtaining shared global ethical values in a globalized construction environment but an easy answer on how this is to be achieved is elusive. Additionally, the very real business dynamics of construction project work will also affect how stakeholder management is conducted. Macro-economic and business cultural norms, manifested through contracts between construction project actors (e.g. a client & contractor) could be viewed as restrictive and limiting in stakeholder management terms: the drive to finish work on a project as soon as possible within set arbitrary timeframes (with budgetary targets attached) militates against the employment of stakeholder management strategies. How stakeholder management works effectively in the real pressured environment of a construction project has not been investigated at length or in enough detail.

A further salient point is when exactly should stakeholder management work occur? Although Harris (2010) states that using the separate phases of a construction project can assist in stakeholder identification, the applied investigation of stakeholder management across various phases of a construction project has yet to occur. In many respects, the concept is still open to empirical interpretation and the testing of new ideas. For example, an events-led strategy for stakeholder management has yet to be explored. As construction projects may be viewed as consisting of many series of events, some events will have be more significance to stakeholders than others (e.g. the installation of electrical wiring in a room might not be an event of interest to stakeholders, whereas the building of an electrical sub-station to provide extra electrical power might). An actions and events led theory may, therefore, be a valid angle from which to explore stakeholder management work.

The very real practical questions of conducting any kind of stakeholder management initiative should be recognised more in the literature: if research work is disjointed from the realities of construction project work then the practicality and validity of employing any stakeholder management initiatives are seriously compromised.

Directions of further research

The construction stakeholder management discipline will only evolve through more focused and robust research work in the field: theories, ideas and propositions removed from the real-world of construction project work lack the robust evidential base required to make them truly valid. There still remains great scope for researchers to undertake insightful and groundbreaking work in this area. For example, Thomson (2011) recently noted how stakeholder perceptions of a “successful” project cannot be easily determined at the beginning of a project endeavour: the implication being that managing stakeholder expectations may currently be executed in a very one-dimensional way (i.e. project success and stakeholder satisfaction being simply a matter of meeting budgetary and temporal targets). Such work reminds us that effective stakeholder management remains critical for construction project success. Stakeholder management also continues to offer a rich vein for further research activity. However, researchers should remain mindful of the limitations of any work undertaken as stakeholder management remains a complex and abstruse subject to engage with.

CONCLUSIONS

This paper has highlighted some of the issues of concern surrounding the construction stakeholder management literature. Questions and issues remain over the validity of ideas, theories and propositions, and these have been usefully deconstructed to pivot around several key themes. Firstly, how construction organisations engage with their moral obligations towards stakeholders and how this impacts (or is affected by) their business imperatives is under-investigated. Secondly, the literature is prone to theoretical abstractions which have little empirical grounding in reality. Thirdly, the temptation of scholars towards theoretical convergence and simplification (in order to create all-encompassing conclusions) should be resisted in favour of research work which is more divergent and unique in nature: more valid and valuable insights regarding stakeholder management will result. Finally, the practical implications of conducting stakeholder management in the construction domain should be recognised, researched and debated more. Too often, the very real practical issues of conducting stakeholder management in a construction project setting have been ignored or omitted from the academic discourse.

Researchers can potentially make the stakeholder management discipline more mature by re-focusing the research lens towards topics and issues that have not been sufficiently tackled by the CME academic community. The stakeholder management concept itself will gain greater credence amongst AEC professionals if it engages more with the realities of construction project work with theoretical abstractions being supported by empirical evidence from the field. More divergent and multiple narratives engaging with the stakeholder management concept will also enhance understanding and clarify the pertinent issues. Only by maturing as a discipline, will construction stakeholder management thinking become more robust. Then findings from the construction industry can inform the stakeholder management discipline itself, the school of thought from which it has emerged.

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CLIENTS AS DRIVERS OF INNOVATION: LESSONS FROM INDUSTRIALISED CONSTRUCTION IN SWEDEN

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Stakeholder pressure is an important trigger for innovation. Industrialised construction (IC) has been proposed as a means to improve the building sector, nonetheless, Swedish clients are not facilitating IC. The purpose of this research is to further the understanding of the client's role, as a decision maker, for improving the rate of innovation in construction by learning from how clients respond to IC in Sweden. Analyses of data from 27 Swedish property owner organisations indicate that IC is associated with uncertainty and equivocality, and that investment decision-making on new-build is concerned with potential losses and regret rather than with gains. Due to such biases, decision theory suggests that even when an innovation is considered a better provider of desired outcomes, clients are likely to decide on common practice. Drawing on information processing theory, analysis shows that current information processing practice does not support reduction of uncertainty, or management of equivocality. To drive innovations such as IC that can change status-quo, clients must be able to manage equivocality as information is scarce, and common practice is challenged. For clients to benefit from innovations, a higher involvement in early innovation development is proposed.

KEYWORDS: Construction client, Decision making, Industrialised construction, Innovation, Uncertainty

INTRODUCTION

In the construction sector, the rate of innovations, i.e. new technical solutions, new methods of construction and new forms of cooperation, is perceived to be low. Stakeholder pressure has been identified as an important trigger for innovation, e.g. in the study on (green) innovation in Sweden by Gluch et al. (2009). Furthermore, the construction client has been identified as a key stakeholder in this respect, c.f. UK studies by Abidin & Pasquire (2005) and Pitt et al. (2009). The importance of the client for the overall development of the building sector has also been put forth in government enquiries. For example, Statskontoret (2009) concluded that there is a potential for sector improvement, not least concerning the role of the client. By exercising market power, the client can affect the development of the sector. The enquiry (Statskontoret 2009), however, noted that clients were driven by different factors for their work, and that important issues differentiating clients are to what extent life cycle costs and long term property management are evaluated. Even though professional Swedish construction clients, along with other construction stakeholders, demand for improvements that require radically new ideas, practices and/or objects (processes, products, services, technologies, management approaches), it seems unclear how clients respond to such initiatives, and thus drive, innovation.

In order to meet stakeholder demands, industrialised construction (IC) has been proposed both in Sweden and in other countries, as a means of improving the competitiveness and effectiveness of the building sector (SOU 2000, Goodier & Gibb 2007, Pan et al. 2007). Nonetheless, according to Statskontoret (2009), one of the recurring problems of the building sector is that clients are not facilitating IC. Therefore, the purpose of this research is to further the understanding of the client's role, as a decision maker, for improving the rate of innovation in construction by learning from how clients respond to IC in Sweden.

The clients at focus are professional Swedish maintaining clients (Frödell et al. 2008), who build to own, let and maintain multi-dwellings. Both private and public property owner organisations are included. This group of clients is chosen as they represent the ones presumed to have the most long-term view on the investment, including property management issues. IC, as referred in this paper, focuses on volumetric prefabrication of timber framed multi-dwellings, representing the highest level of industrialised construction (level 4; "complete buildings" as defined by Gibb & Pendlebury (2006)) and the most recently presented framing material used in multi-storey (>2 storey) buildings in Sweden (allowed since 1994 after a change in the Swedish building code).

It was concluded in a previous study on IC in Sweden (Höök 2005) that volumetric prefabrication of timber framed multi-dwellings could be classified as a system innovation, presenting uncertainty to the client decision maker. The prefabrication of volume elements changes the roles of actors and the production process differs from that of on-site, traditional construction (Höök & Stehn 2008), which enhances client uncertainty. In this research we are differentiating between client uncertainty and client equivocality, since these concepts imply different information processing approaches, and information processing is central in decision-making. Consequently, the purpose is met by discussing the impact of client uncertainty and equivocality on decision making, based on information processing theory and decision theory. Thereafter, the implications for client response to innovation in the construction sector are discussed, based on an analysis of the case of IC in Sweden.

The research focuses on client investment decision-making on new-build and is based on; reviews of information processing theory and decision theory (with main focus on the influence of uncertainty and biases in decision making); empirical findings from studies on IC in Sweden (with main focus on studies addressing construction clients), and; analyses of data files consisting of background data from 27 property owner organisations in Sweden. The data files are collected between the years 2006-2009, and are addressing clients' perspective on IC (for description of empiric data and methods employed, c.f. Levander & Sardén 2009; Levander 2010a; Levander 2010b).

A DECISION MAKING PERSPECTIVE ON INNOVATION

The rational model of decision making assumes that the decision maker follows a process of six steps in a fully rational manner (c.f. text books on decision making such as Bazerman 1998; Robbins 2005). These six steps, sometimes conflated to five or three, have been described by numerous researchers approximately as follows: (1) define the problem that needs to be solved, (2) identify all criteria relevant for the decision making process, (3) weight the identified criteria according to their relative value or importance, (4) generate a full list of alternatives or possible courses of action for solving the problem, (5) assess and rate each alternative on each criterion, and finally (6) make the decision by following the result from the computation of which is the optimal (value or utility maximizing) alternative.

Although logically appealing to most people, this normative model is based on assumptions that are very seldom fully met. In the real world, this normative model is applicable for routine decisions where the same decision has been made many times, following an experience based, formal procedure (Butler et al. 1993). Moving beyond the routine decision, Simon (1957) and March & Simon (1958) suggested that individual judgment is bounded in its rationality.

The modern understanding of judgment is represented by the work of Kahneman and Tversky (e.g. Tversky & Kahneman 1974; Kahneman & Tversky 1979). The more information a decision maker is missing, the more likely it is that the decision maker relies on rules of thumb, i.e. heuristics (c.f. Tversky & Kahneman 1974), to simplify information processing and fill information gaps (March 1994). Although often helpful, these cognitive processes also lead to biases, which explain why decisions made do not follow the suggested normative model and many times do not result in the highest expected utility (Tversky & Kahneman 1974). In their work on prospect theory, Kahneman & Tversky (1979) also discuss how individuals react differently to gains and losses. For example, they found that decision makers are risk-adverse with respect to gains, but are risk-seeking with respect to losses. This implies a higher probability choice is preferred even if it offers lower expected utility than the alternative.

Other biases suggested as playing a strong role in decision making under uncertainty are anticipated regret (Bell 1982) and the status quo bias (Samuelson & Zeckhauser 1988; Ritov & Baron 1992). Referring to, for example Bell (1982) and Kahneman & Miller (1986), Toole (1994) argues that decision makers appear to compare levels of future regret rather than benefits, and that alternatives with relatively higher levels of regret are avoided. More uncertain alternatives are associated with higher levels of potential regret and the reaction of the decision maker is exemplified by Toole (1994, p. 34) in the following illustration: "If a more uncertain alternative was chosen and an undesirable outcome occurred, the decision maker would have a high level of regret (e.g., 'I knew that was too risky!') … if the less uncertain alternative is chosen and an undesirable outcome occurred, the regret level would be low (e.g., 'I really didn't have any choice since I didn't know what the other alternative was about.')". Empirical tests of predictions from regret theory have provided mixed results; nevertheless, the notion that people take regret into account when making decisions is supported (Zeelenberg 1999). In particular, it is found that decision makers are motivated to avoid post-decisional regret and therefore tend to make choices that "shield them from threatening feedback on foregone courses of action" (Zeelenberg 1999, p. 101). Zeelenberg (1999) discusses conditions inflicting on regret and suggests that the regret will be a more prominent bias when for example trade-offs is implied between important attributes of different alternatives and when the decision cannot be reversed. He also suggests that decision makers tend to discount outcomes that are distant in time and base their decisions on outcomes that are closer in time (see also work on intertemporal choice by e.g. Loewenstein 1992).

When the decision maker is faced with new alternatives, (s)he often sticks with that of current or previous decision, i.e. the status-quo alternative (Samuelson & Zeckhauser 1988). To stick with status-quo could, for example, be about following regular company policy, re-electing a sitting representative or purchasing the same product brands (ibid.). The status-quo bias seems to be stronger when the number of alternatives is high, and weaker when there are strong individual decision maker preferences for an alternative (ibid.). Samuelson & Zeckhauser (1988) suggest such explanations for the status-quo bias as presence of

uncertainty, transition costs, cognitive misperceptions, psychological commitment, regret avoidance and drive for consistency.

MANAGING BIASES IN DECIDING ON INNOVATION: AN INFORMATION PROCESSING PERSPECTIVE

The decision theories discussed in the previous section (i.e. prospect theory, regret theory, and status quo bias) provide similar explanations for why people often are biased against choices that offer higher expected utility, but are more uncertain (Toole 1994). A decision maker may reject an innovation that provides superior performance and that may have the same chance of failure as the solution currently employed because of the higher level of regret associated with the potential failure of the innovation, whilst a potential failure of the conventional solution is associated with low regret since the decision maker did what he and others have always done (ibid).

Following from these decision theories, Toole (1994) concludes that if uncertainty is high, potential adopters of innovations would rarely adopt without gathering additional information because the decision would probably reflect status quo or regret bias. The bias against a high uncertainty innovation would be so excessive that the existing product or method would always be judged to offer higher relative advantage (Toole 1994). The research by Toole (1994), where he studied homebuilders and their adoption of innovations, showed that those more apt to adopt innovations had superior information-processing abilities related to building innovations, they used more sources of information about new products than did non-adopters, and they involved more functions in making the decision.

Since Galbraith (1973) proposed his model relating structural design to information processing requirements, it has become accepted that the purpose of information is closely related to uncertainty; that is, the purpose of information is to reduce or preferably remove uncertainty. Most decision makers want to achieve certainty in an uncertain world. Bazerman (1998) states that they fail to accept that decisions often need to be made in the face of uncertainty. Galbraith's (1973, p.5) definition of uncertainty is frequently cited and defines uncertainty as: “The difference between the amount of information required to perform the task and the amount of information already possessed by the organisation”. Thus, uncertainty is about lack of explicit information or data, i.e. not having data on defined variables.

To reduce uncertainty, organisations need to enable additional data processing (Galbraith 1974; Galbraith 1977; Tushman & Nadler 1978) and need to ask a large number of questions, acquire information and obtain answers to explicit questions in order to solve known problems (Daft & Lengel 1986). However, an organisation’s situation can often be interpreted in more than one way, and the participants can either find themselves in a position of not knowing what questions to ask, or of there not being any clear answers to the questions asked (March & Olsen 1976). In such cases, one has to deal with equivocality rather than uncertainty (Weick 1979; Daft & Lengel 1986).

Equivocality is about confusion, lack of understanding, disagreement, lack of clarity and ignorance, i.e. not being able to define influencing variables or interpret available information (c.f. Weick 1979; Daft & Macintosh 1981; Daft & Lengel 1986; Daft et al. 1987; Weick 1995; Weick 2001).

While uncertainty can be reduced if additional information is available and thus reduce biases and make the decision making more rational, high levels of equivocality implies that the identified problem may not be the problem at all, that criteria may be irrelevant, that ranking criteria is not a relevant task, and so on, and that more data and facts may just distort decision making even more. The solution for resolving equivocality differs from that for reducing uncertainty. Instead of seeking answers, the organization seeks clarification, problem definition and agreement through exchange of subjective views and opinions (Daft & Lengel 1986). Weick (1995) adds that confusion created by multiple meanings (i.e. equivocality) calls for social construction and invention, while ignorance created by insufficient information (i.e. uncertainty) calls for more careful scanning and discovery. Daft & Lengel (1986) conclude that, to reduce equivocality, 'richness of information' rather than 'information amount' is the key. They also provided a conceptual framework for ranking media with respect to their capacity for reducing uncertainty or for resolving equivocality for decision makers. This media richness theory ranges media from the richest (face-to-face meetings and communications) to the leanest (rules and regulations, non-personalised written information). A mismatch between equivocality and richness, i.e. high equivocality and low media/information richness, is suggested as one possible explanation for communication and decision-making failure (Daft et al. 1987). Adoption of innovation should from this perspective not only be a question of gathering and processing high amounts of information, but also about how information is gathered and processed. This argument is consistent with Toole's (1994) findings that adopters of innovation involved multiple functions in the decision making.

BIASES IMPACTING ON CLIENTS DECIDING ON IC

IC challenges common practice

Even though it could be argued from a contractor point of view that; IC methods have been employed for many years; the forms of cooperation are well documented; the contractors are well established; and the material and technical solutions have been tested, IC differs from what Swedish construction clients are accustomed to. IC encompasses novelty in multiple dimensions: new methods of construction, new forms of organisation and cooperation within the construction process, new and non-local actors, new framing materials and subsequent technical solutions, and thus brings about the characteristics of an innovation seen from the clients' perspective, see further table 1. Hence, IC challenges common practice in the sector as well as stakeholder expectations and shared pictures of how things can and should be done in order to realize construction.

Client equivocality is high but efforts to reduce equivocality are limited

Previously collected data and transcribed interviews (Levander 2010a) from four Swedish property owner organisations (private and public), addressing a total of eight interviewees, were analysed in depth to identify uncertainties and equivocalities experienced by the clients concerning IC. It was found that 14 opinions (out of a total of 62) could be classified as uncertainties, i.e. a matter of lack of information. The rest of the opinions (48) could not directly be related to an information shortage. Instead they presented examples of different interviewees interpreting and understanding the same available information differently, individuals making conflicting interpretations of one and the same piece of information, and individuals asking for more information without being able to define what information they actually need.

Table 1: IC brings about the characteristics of an innovation, and thus, challenges common practice – examples from clients' perspective

Dimensions of novelty in IC	**Example, clients' perspective**
methods of construction	The leading timber framed volume contractors have a prefabrication degree of 80-90 % (c.f. Höök 2008). Hence, the construction process is transformed into a process where industrialised principles for production are employed rather than conventional construction project management practices. Though supporting production control, the construction process becomes less visual and transparent for the client.
organisation and cooperation	General contracts are the most common form of contracts between clients and contractors in Sweden. The industrialised building process, however, implies a design-build contract*, which means that the contractor takes full responsibility for both design and construction. The design-build contract results in design decisions having to be made at an earlier stage in the building process along with altered, and unfamiliar, cooperation forms with contractors.
non-local actors	Volumetric prefabrication of timber-framed multi-dwellings has been driven by small and non-local contractors, as opposed to the local on-site contractors often earlier engaged by the client and to whom relations are already established (Levander 2010a).
framing materials and technical solutions	Timber is utilised as frame material in volumetric prefabrication because of the material's high strength/weight ratio and manufacturability, which support factory production and long-distance transportation of modules. To manage the peculiarities of the material and fulfil functional demands, new technical solutions are developed and employed.

Note: *For the contractor, who often incorporates all different trades within one single company, this means an opportunity to make use of the advantages of the industrialised process.

Two of the interviewees explicitly expressed a feeling of having "a million questions" but at the same time said that they "do not know which questions to ask" or to whom. The overall conclusion from the analysis is that the level of equivocality is high. Equivocality is high both compared to the status-quo alternative within the interviewees' current frame of reference that they related the IC alternative to, but also compared to the level of uncertainty concerning the IC alternative.

Furthermore, an analysis of the current information processing (IP) practice within client organisations, based on the full set of data files from 27 organisations, showed that current practice was characterised by:

- Lack of communication between the property-development and property-management departments within the organisation. Only one exception was found. In one of the 27

organisations two friends were working at the different departments and, due to their friendship, had a well-functioning communication.

- Deficient follow-up of running costs (i.e. lack of experience data from property management) on individual properties in stock. Most of the organisations did not systematically gather the cost data on property level necessary to make follow-up analyses. Those few, who did gather data, did not use it to make follow-up analysis. Specifically, in one case, the organisation had a well-developed system for information gathering and processing data, but this data was gathered by the property-management department and was not used by property development as support in the decision-making in new-build.

- An inconsistency between goal attainment and investment decision criteria. The pronounced goal is to maximise long-term return of the property stock, wherefore running costs should be considered in the decision-making in new-build. However, the main decision criterion is initial construction cost (not including life-cycle costs).

The IP practice does not generally support the systematic gathering of data, but perhaps even more important, it does not enable transfer of rich data. Decisions are generally made by one or a few individuals from the same department without access to experience data from others. Consequently, the current IP practice does not support the reduction of uncertainty, nor the reduction and management of equivocality connected to the IC alternative within the decision-making process.

Future regret is a prominent issue

Within the empiric data material, several indicators are identified of anticipated regret being a prominent issue when making IC investment decisions, see table 2. Clients explicitly expressed a fear or anticipation of future regret following on the choice of IC over any other alternative considered to be more conventional by the client organisation. Together with the uncertainty and equivocality previously discussed, as well as the IP practice within the client organisations, future regret becomes a prominent issue.

Investment decisions on IC are based on policies

Clients that have decided to invest in IC have followed organizational policies, rather than basing their decision on a critical review. To base decisions on such a criterion as “investment cost” is a widely accepted policy in many of the private client organisations Some of the public organisations had rather made a policy decision on “testing IC”. The equivocality was however still high among these organisations and the next investment decision should therefore still be expected to be biased by equivocality and anticipated regret.

CLIENT RESPONSE TO IC IN SWEDEN

IC in Sweden has been put forth as a way to meet clients’ demands for lower costs, improved quality and shorter time frames within construction (Engström et al. 2009). With its off-site characteristics and process-orientation, IC is seen as a means to attain advancement in construction (e.g. Statskontoret 2009). Volumetric prefabrication of timber-framed multi-dwellings, i.e. the IC alternative in this paper, entails all of the identified advantages of IC, such as indoor prefabrication, long-term relationships, less subcontracting, and less specialisation (Nord 2008). Not surprisingly, Swedish clients are generally positive to the

expected benefits of IC. However, the clients are not actively driving the change towards industrialisation (Engström et al. 2009).

Table 2: Indicators of anticipated regret when making IC investment decisions

Indicators	Results found in transcribed interviews from empirical studies presented in Levander (2010a)
Clients expect negative outcome from already made investment decisions on IC investments	Clients, even those who already had decided on IC, explicitly expressed a fear or anticipation of future regret following on the choice of IC. Clients had considerations concerning the long-term performance of timber as framing material as well as the technical solutions presented by the IC contractors. Clients expressed uncertainty with respect to their own ability to evaluate future maintenance needs and costs.
Clients experience trade-offs	For clients, the choice between conventional and IC implies a trade-off between important attributes, for example the trade-off between more well-known, flexible solutions and lower initial costs.
Clients find the definite decision point in IC as problematic	Clients want to be able to make changes along the course of the construction process, something that is not easily facilitated by the employed industrialised process.
Clients discount outcomes that are distant in time and base their decisions on outcomes that are closer in time	Clients' main motive, i.e. decision criterion, for choosing the IC alternative over others has been identified as economic, with an emphasis on the initial construction costs. In addition, lowered credit costs due to production advantages such as short building time on site are mentioned.
Clients are missing information	Clients lack information on IC performance data, e.g. information on the capacity of the timber frame to handle building physics and statics.
The IP practice within the client organisations is neither supporting reduction of uncertainty, equivocality nor decision-making biases	As presented in previous section, the assessment of current IPP shows that it is not characterised by good practise for managing uncertainty and equivocality, hence greatly influenced by decision-making biases such as anticipated regret.

Due to the high level of uncertainty and equivocality, clients are concerned with the potential losses and regret rather than with gains when facing IC. The anticipations of future regret could be part of the reason for the slow uptake of IC in Sweden. According to descriptive decision theory, decision makers are biased against choices that are less certain, even if the expected outcome is highly desirable. Consequently, clients are more likely to choose tradition over innovation, even when the latter is considered the better provider of desired outcomes, such as short time spans and low cost. This is also consistent with Toole (1994) who referred to future regret when seeking to explain the slow diffusion of innovations amongst home builders in the US.

When clients face IC they experience a high level of equivocality, and thus not only a high level of uncertainty. When equivocality is high, one cannot be sure that the information being collected to reduce uncertainty is even relevant for the decision at hand. When deciding on a specific project, equivocality would be reduced by defining what questions that are relevant. However, the problem is not necessarily defined correctly and whatever is done from that point forward will not change the decision into a value-maximising mode. Hence, clients are

not acting as value-maximisers. To deal with what cannot be seen as common-practice requires rich information. One lesson from IC is that clients lack the skills on how to gather and process information to support decision-making beyond routine decisions (status-quo).

CONCLUSIONS AND DISCUSSION

When clients within their decision-making in new-build face an innovation alternative like the one studied in this research, IC in Sweden, they are not only experiencing high levels of uncertainty but what is more, an even higher level of equivocality. This causes clients' decision-making to be greatly affected by heuristics and consequently biases, such as anticipated regret, and one consequence is that clients are not acting as value-maximisers. When a situation such as a decision-making process is greatly influenced by uncertainty and equivocality it imposes demands on the information processing. It is concluded that the current information processing practice within the studied client organisations, when choosing between the conventional (status-quo) alternative and IC (the innovation), does not support reduction of uncertainty and equivocality, and thus not reduction of biases influencing the decision-making. The fastest way to reduce equivocality is probably to stay with status-quo. The information processing costs are thereby cut short, risks can more easily be calculated and potential losses are well known. In the long run, however, such behaviour will effectively prevent the organisation from innovation uptake, and in fact act as a change-restraining force within construction.

To drive innovations such as IC that can change status-quo within individual client organisations, but also on a sector level, client organisations must be able to manage high levels of equivocality as the amount of information is low, and common practice is challenged. For clients to benefit from innovations, a higher involvement in early innovation development is proposed. Similar conclusions have previously been drawn on project level; e.g. Gibb (2001) stresses that critical information needs to be agreed on by all parties at an early stage in the project, and that the more unfamiliar the stakeholders are with the contents of the project, the more vital is early agreement. However, at this point in time, the client has already made a vital choice on what project to embark, and the IC alternative might have been made impossible to choose.

As the results from the case of IC have shown, there is a risk that the main decision criterion when choosing innovation will be initial cost. The potential implication for client response to innovation is that clients will drive innovations characterised by lower initial construction cost, rather than by long-term criteria, e.g. reduced life-cycle costs or reduced environmental impact. Hence, innovations providing long-term benefits may be overlooked in favour of more near-time benefits. To base an adoption decision on such a criterion may drive the sector towards a change, adopting new innovations, but not necessarily the advancements the sector wants in the long run. For clients striving for sustainable development this could hardly pass as a good decision or a good strategy for driving innovation in construction.

It should be noted that we have not (yet) in detail studied how decision makers within the client organisations make decisions when they face the choice between the conventional solution and the innovation IC, that is; what functions within the organisation that are involved in the process; how decision criteria are established and; how information is gathered, processed and employed within the decision process. This decision making process has, to our knowledge, neither yet been studied by others. Nevertheless, client organisations' information processing capabilities will most likely affect decision making, i.e. organisations

with high capability can reduce uncertainty and manage equivocality presented by innovations. This should be of particular importance for clients obliged to make investments in new-build not only for the better good of their organisation, but for the better good of the construction sector and the society, e.g. public clients in Sweden. With this paper we want to shed light on the fact that how client decision-makers process information and make their decisions greatly may influence what overall long-term improvements that innovations within construction may entail. We propose improved information processing capability within client organisations in order to reduce both uncertainty and equivocality, and subsequently, reduce biases in decision making and better support client driven innovations.

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TOWARDS AN AGENDA FOR USER ORIENTED RESEARCH IN THE BUILT ENVIRONMENT

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The background for this paper is the authors' participation in user oriented research in relation to the built environment and an aim to provide input to the future research agenda in this area for instance in CIB, who has recently taken an initiative to increase research focus on clients and users. The purpose is to present an overview of different approaches to user oriented research and propose directions for further research that can help to give the users a stronger position to impact the built environment they experience. The methodology is a literature review of research approaches like usability, user involvement in briefing, user driven innovation and participatory design. The different research approaches are presented, analysed, compared, and evaluated. The paper suggests that further research in this field is strongly needed. The different approaches vary in theoretical foundations, methodologies and development, but they are in most cases not incompatible and they use many similar research methods. Further research should focus more on direct interactions with and involvement of users and mostly qualitative research methods should be applied in real life situations or simulations.

KEYWORDS: Usability, built environment, briefing, user driven innovation, participatory design.

INTRODUCTION

This paper aims to present current trends in user oriented research in the built environments and outline possible ways forward for research and practice to give the users a stronger position to impact the built environment they experience. The background is the authors' participation in user oriented research in relation to the built environment. This includes a leading role in CIB W111 Usability of Workplaces since its start. CIB has recently taken an initiative to increase research focus on clients and users by establishing a new working commission W118. This paper can be seen as an input to support this initiative but is also aimed at other researchers, institutions, funding organisations, and practitioners.

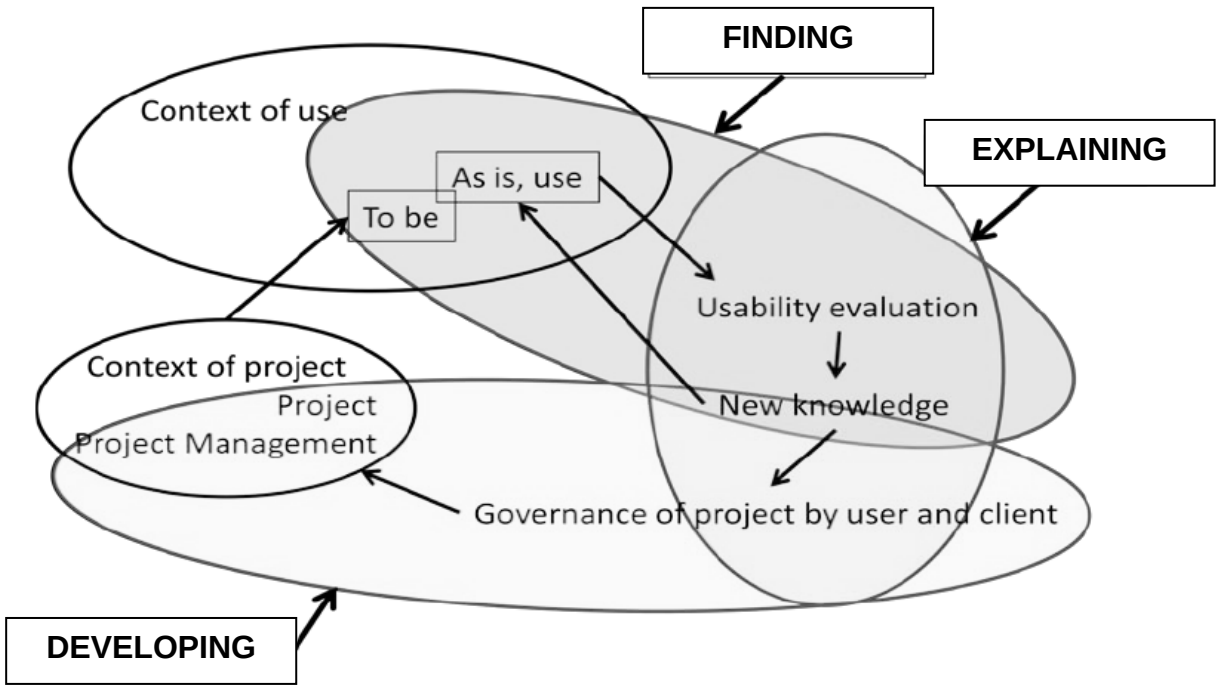
The starting point is a state of the art of recent research approaches like usability, user involvement in briefing, user driven innovation and user involvement in design. The

methodology has been a literature review divided between the three authors according to their special areas of competences and fields of interest in relation to user oriented research. The paper has been developed during a number of meetings, a workshop, and exchanges of inputs and comments. The paper is exploratory and does not intend to cover all approaches of user oriented research. Areas like research on stakeholders and value management are for instance not included.

Recently, a large collaborative project on usability in the built environment - REBUS - was carried out in the Nordic countries with national projects in Finland, Norway and Sweden (Blakstad et al., 2010). One of the joint results was the model shown in Figure 1 which distinguish between the "As is" use situation and how new knowledge can be developed by usability evaluations and feed into action leading to a new "To be" situation. The overall management or governance of these processes is seen as crucial. The model was developed to map the different research carried out the three countries. For this paper we have used the REBUS model to map the different approaches of user oriented research that we have identified. For this purpose we have named the different places marked by the REBUS project as: Finding, Explaining and Developing. A fourth place could be Implementing or Executing, but this has not been relevant as part of this work.

The model is used as a basis for comparing the different research approaches towards the end of the paper after presenting the approaches. The paper is concluded with suggestions for further user oriented research.

Figure 1: REBUS model. Adapted from Blakstad et al. (2010)



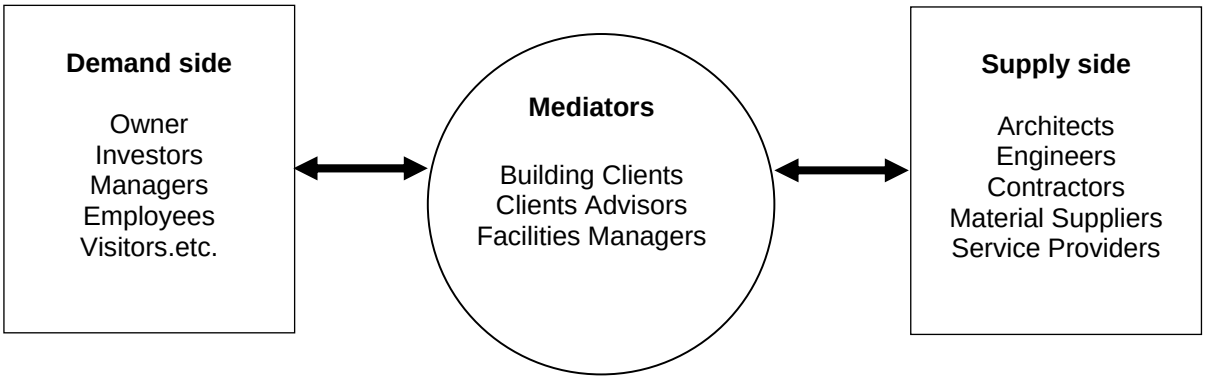
RESEARCH PERSPECTIVES

Clients and Users

So far research concerning building clients has been very limited even though there has been an increasing interest in the role of the client in many of the policy reports and development programs that has been launched in several European countries during the last 15 years. However, the interest for the client has mostly been from a supply perspective with a focus on the clients' role in relation to building projects. A typical example is Bertelsen et al. (2002), who discuss the possibility of the client acting as a change agent in relation to the building process as opposed to a more passive role as procurer. A complete opposite role is seen for instance in Public-Private Partnerships, where even the role as procurer is outsourced to a private consortium leaving the public organisation to the role as tenant specifying the demand to be provided by the supply side.

A more balanced view of the role of building clients is shown in Figure 2, where the building client is seen as a mediator similar to client advisors and facilities managers. The mediators are placed between the demand side and the supply side, and their role is to specify the needs from the demand side translated into requirements or service levels, which is in accordance with the professional language of the providers from the supply side. The need for such mediators in building projects and Facilities Management (FM) provision is due to the complexity and specialised character of such deliveries.

Figure 2: Clients as mediators. Source: Jensen (2002)



Building clients and facilities managers are often an integrated part of the demand side organisation, and the demand and their roles are very dependent on which type of organisation they represent. In business management and in FM it is common to distinguish between strategic, tactical and operational levels of organisations and interaction between FM and the core business part of organisations. This is even part of a European FM standard, where it is further defined that the interaction is with the client at strategic level, with the customer at tactical level and with the end user at operational level (CEN/TC348, 2006). A similar distinction is not common in the construction industry.

Users of the built environment have been discussed in many previous studies, but according to Olsson, et al. (2010), the term user is often oversimplified by assuming that there is only one group of users. Instead, it is proposed to structure the users in a model for user categorisation based on a supply chain approach. The proposed common user roles are following:

- Owners
- Facilities management and service personnel (operating the building)
- Management of the organisation based in the building
- Service providers (examples: teachers in a school, doctors and nurses in a hospital)
- Service receivers (examples: pupils in a school, patients in a hospital)
- Indirect service receivers (examples: child's parents, patients' relatives)

Other useful, though more simplified distinctions of users are between demand and supply side by Kernohan et al. (1992) and the three kinds of users: the user, the owner and the facility manager, by Sæbøe and Blakstad (2009).

There seems to be a strong need for more research on the building client taking a demand perspective and looking at the client as organisations and to distinguish between the different organisational levels in relation to building projects and the involvement of users.

Usability

The concept of Usability is defined in ISO 9241-11 as: *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"* (ISO, 1998).

We have identified three different research traditions and perspectives. Usability engineering focuses on individual users of industrial products and IT-software. Usability and accessibility also focuses on individual users but in relation to the built environment and particularly the needs of less able users like disabled and elderly. Usability appraisal also focuses on the built environment, but the perspective is on users as parts of organisations seen from a FM point of view.

Usability Engineering

The concept of usability has its roots in evaluations of user interfaces of computer software and consumer products like electronic equipment. One of the seminal works is the American book by Jakob Nielsen (1993) on Usability Engineering. Here usability is seen in the context of system acceptability and as part of usefulness together with utility. The attributes of usability is defined as easy to learn, efficient to use, easy to remember, few errors, and subjectively pleasing.

Usability engineering is widely understood as Usability Testing, which is a method, where the already developed product prototype is being tested in a Usability Laboratory with a number of potential users to see if it is acceptable and useful for the target group members. That process will often lead to development of additional improvements and making a second prototype. Traditionally the manufacturing companies are themselves developing the prototypes, innovating and making patents in their R&D (Research and Development) departments and only invite the users for the Usability Testing. Even though the innovation by manufacturers and usability testing was and still is widespread in many fields, it has been shown that the traditional pattern of concentrating innovation support resources on a few individuals is hugely inefficient, because it is hard to determine the right people who might develop a valuable innovation (von Hippel, 2005). Usability testing is typical based on a man-machine relationship with individual users.

Usability and Accessibility

The concept of accessibility has over the last decades become increasingly important in relation to disability and the built environment. The concept has changed the focus from

dealing mainly with physical access for wheelchair users towards enabling everybody, including persons with disability, to participate in the social and economic activities for which the built environment is intended. Accessibility is a basic feature of the built environment concerning the way in which housing, public buildings, places of work etc. can be reached and used.

The focus on accessibility was internationally brought forward by the United Nations, which in 1982 decided on a World Programme of Action on Disabled Persons and in 1993 agreed on Standard Rules on the Equalization of Opportunities for Persons with Disabilities (United Nations, 1994). This was followed by the European Concept for Accessibility in 1996, to be implemented in the national laws of all member countries. The European directive was based on the universal design principles, applicable to the design of buildings, infrastructure, and building and consumer products. The principles were the provision of safe and enjoyable environments that are accessible to everyone, and rejection of the division between able-bodied and disabled people (Goldsmith, 1997).

Iwarsson and Ståhl (2003) discuss the relation between accessibility, usability and universal design. Accessibility refers to compliance with official norms and standards, thus being mainly objective, while usability concerns fulfilment of functional requirements and is mainly subjective in nature based on individual interpretations. They see accessibility as a person-environment relationship and usability as a person-environment-activity relationship. They see usability as a more positive and complex term than accessibility and suggest that accessibility should be partly replaced by usability. They also highlight universal design as a more process-oriented and less stigmatizing concept than accessibility.

Inclusive Design is a further development from Universal Design. The first convention on Inclusive Design was held in London in 2000 and this led to the Stockholm declaration from 2004, where the definition of Inclusive Design was provided as “design for human diversity, social inclusion and equality” (Guida et al., 2008). I 2006 the United Nations adopted a Convention on the Rights of Persons with Disabilities, which unlike the World Programme from 1982 and the Standard Rules from 1993 is a legal binding document. It has to be ratified by the member countries and implemented in national legislation. Accessibility is one of the general principles of the convention (United Nations, 2006).

There has particularly in Sweden been some research of usability with focus on housing adaptations. An instrument for Usability in My Home (UIMH) has for instance been developed. This instrument is self-administered and consists of 16 items rated on a 7-graded scale targeting activity aspects, personal and social aspects and physical environmental aspects (Fänge and Iwarsson, 2003). This research appears to be very instrumental with a main focus on ergonomics.

Usability Appraisal

This section of the paper mainly draws upon the continuing research into the application of usability concepts to the built environment conducted by CIB W111 (Alexander, 2005, 2008 and 2010). The objectives of the research were achieved through a series of case studies and associated workshops designed to identify and evaluate the ways in which stakeholders in projects were involved in decision making about building use and the methods and tools they used. The research has enabled a number of broad conclusions about the nature of usability as a concept and its application to the built environment and has challenged the basis of conventional approaches to briefing and post-occupancy evaluation.

In summary, the group sees usability as *'a cultural phenomenon that can only be improved through a better understanding of user experience, considered as situated action in a specific context'* (Alexander, 2008). The section discusses practical implications for built environment professions and for the development of management processes and raises specific issues for usability research in the built environment.

Much recent effort in construction research in Europe and particularly in the UK has been directed to creating 'a client-oriented, knowledge-based, value-based industry' (UK CTP/ECTP). Application of the concept of usability in the built environment presents a number of key challenges to conventional construction and property perspectives:

- User focus – usability places a focus on the user and the organisation rather than the building;
- Demand driven – usability recognises the dynamic requirements of organisations (and communities), derived from the strategic objectives;
- User experience – usability is primarily concerned with the perceptions of users rather than the intentions of designers and service providers;
- Contingency quality – usability is contingent on user values rather than an inherent function of the built environment;
- Context of use – consider facilities in the context of use rather than as a project (context of action);
- Process oriented - usability is considered as a process rather than as product or service provision;
- Service production – like all services, facilities are co-produced by service users;
- Relationship management – usability implies changing relationships with users;
- Learning process – usability exchange of knowledge amongst users, managers and service providers.

Fenker (2008) relates usability to user experiences and social relations between users and facilities and describes usability as a process that can only be understood as a social construction where the building act as a sort of stage. According to Fenker, '*...the artefacts are bearers of a set of possibilities and constraints as well as, most importantly, activity and social practices*'.

This was also reflected in the chosen theme of the recent CIB W70 conference in Sao Paulo – 'FM and the experience economy'. In his opening address, Da Graca (2009) introduced familiar themes that have been central to the Usability work over the past 10 years (following Pine and Gilmour's seminal work in service marketing) and argues that these should now be the focus of FM responsibilities. In the preface to the conference proceedings, Da Graca (2010) stressed the need to open the way to demand management focusing on the user experience. We need to understand user behaviour, user needs and user experiences and more: we need to manage and systematize the user experience (in a broad sense). We need to learn how to design experiences. Good FM briefings with good design. We have the necessary tools but we need to put them to work. He suggests that research in this area is essential. We need to practice FM which focuses on the User Experience (UX), looking at the demand side, managing experiences and putting the resources to work.

The most known assessment methodology for buildings is Post Occupancy Evaluation (POE), used since the 1960s. 'Post occupancy' refers to the fact that the building is already taken to use at the point of evaluation. According to the definition of Preiser et al. (1988, 2005), POE

is *"the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time"*. Conventionally, POE is carried out by trained professionals or researchers and the building occupants would answer questionnaires, participate in interviews and workshops.

The British Council for Offices (BCO) suggests two main purposes for a POE. The main aim is to gain feedback of how successful the workplace is in supporting the occupying organisation and individual end-users. The other purpose is to use POE to assess if a project brief – the programme of requirements, has been met.

Contingent user values are not easy to explore using conventional techniques such as POE and there have been calls for multi-method approaches (Blakstad et al., 2008) and a greater range of methods for understanding user experience (Alexander, 2008).

Usability evaluations are based on different user's experiences and assessments on how well the buildings perform regarding different parameters. A building's performance can never be seen or understood isolated from an organisational and technical perspective, as those aspects interact and influence each other. Usability has hence a complex nature and can be described as a "wicked problem" (Blakstad et al., 2008). Such problems are characterized by no definitive formulation of solutions, and they are open to multiple interpretations (Rittel and Webber, 1973). According to Blakstad, an adequate approach to "wicked problems" will require multi-method strategies using a triangulation of methods and evaluations with multiple perspectives.

This is in line with findings from previous studies showing that evaluations work best when they are based on several methods and aspects, depending on objective, purpose, focus, competence and resources (Frechtling, 2002). All this implies that usability evaluations are complex, that there is a need for simplification and that the evaluator possesses both theoretical and practical knowledge and skills (Baird et al., 1996). Blakstad et al. (2008) describes how different methods and tools were explored and tested according to their relevance and validity for usability in several Norwegian cases. As pointed out earlier, few of the available methodologies aim directly at evaluation of usability related to organizational objectives. However, they found that many traditional research and evaluation methods had potential to be developed for the purpose of usability evaluation.

User Involvement and Briefing

The traditional view is that briefing takes place before the design starts and the resulting briefing documents should contain the client's requirements for the building design. The brief is usually written by experts. Users are mainly involved as data sources, for instance via interviews and meetings with the experts. According to Nutt (1993), the nature and pace of change has challenged the simple basis of the traditional brief and exposed the limitations in the logic of its process. The future needs cannot be forecasted with confidence, hence the need for a dynamic process.

Prins et al., (2006) discuss the difference between static and dynamic briefing in relation to various procurement routes. They conclude that briefing has to include a well-balanced level of dynamic as well as static aspects. However, indirectly it seems to indicate an important distinction between briefing as a process and a brief as a document (or collection of documents). The brief as a document is basically static, while briefing is, or should be, a dynamic process – at least in projects with an individual design. This suggests that briefing is more than writing briefs, and dynamic briefing should be a process of feedback to, and

dialogue with, all stakeholders. Several authors regard briefing as an almost continuous process, for instance Barrett and Stanley (1999), Blyth and Worthington (2010), Fristedt and Ryd (2004), van der Voordt and van Wegen (2005), and Jensen (2006).

Nutt (1993) proposed the need for a strategic brief and also a facilities management brief - the former to provide a better link between the business operations and the building and the latter to include the operation and development of buildings through their lifetime. One of the main purposes of strategic briefing and user involvement in the briefing process is to ensure an alignment between on the one side business strategy and work process and on the other side the design of building and workplaces (Blyth and Worthington, 2001; Jensen, 2006). Fristedt & Ryd (2004) adopt the idea of strategic briefing as an activity in the pre-project phase, but they compliment the strategic brief by a tactical brief in the design phase and an operative brief for the construction phase.

From a review of the literature it is evident that there is no unified and generally accepted new way of briefing. However, there are some clear trends away from the traditional way of briefing towards what in a recent book has been called inclusive briefing (Jensen and Pedersen, 2009). Inclusive briefing is an interactive process, where the demand and supply sides are involved in a mutual dialogue process. Briefing concerns all the clients' and users' needs in developing a facility and is a continuing process with changing focus in different phases. Briefing is a process involving experts, but the experts are facilitating a guided learning and dialogue process with client and user representatives. The users should be actively involved, for instance in commenting on design solutions, and the involvement of the users is particularly crucial in building projects that are part of a corporate change process like introduction of new organisation, technology and ways of working. The end result of the briefing process is the acceptance of solutions, which have been developed based on a brief.

The recent work by CIB W111 on Usability has highlighted the importance of briefing as a means to achieve usability. However, this finding itself raises a further series of issues and a possible agenda for future research and has interesting implications for the way we think about briefing, particularly when usability is seen as a contingent quality rather than as the inherent functionality of the physical environment. Hudson (forthcoming) argues that much of the existing work on briefing is based on premises that it can be reduced to a rational process, it is part of a finite project, that the final outcomes of this project are buildings or other physical facilities and that user requirements have an external objective existence that can be captured in the briefing process. He goes on to suggest that work on usability suggests that these premises are limited and that a new approach to briefing may be necessary. This approach might be characterised by an emphasis of briefing as creative exploration of possibilities rather than requirements capture, a focus on the social construction of requirements and their evolution over time and a focus on human satisfaction rather than physical facilities.

Some of the characteristics of traditional, inclusive and usability briefing are summarised in Table 1.

Table 1: Traditional, inclusive and usability briefing. Adapted from Jensen and Pedersen (2009)

Traditional briefing	**Inclusive briefing**	**Usability briefing**
Concerns new building/construction	Concerns all client/user needs in developing facilities	Concerns user needs in existing facilities
A definite phase at an initial stage of construction	A continuous process with changing focus in different phases of building life cycle	A continuous process at different phases during occupancy
An expert based information collection	A guided learning and dialogue process	A co-learning process
Users mainly involved as data sources	Users actively involved as part of a corporate change process	Users as co-producers
The result is a brief, i.e. a requirement specification	The result is acceptance of solutions based on a brief	Brief as an evolving 'bulletin board'

Jensen (2006) has identified the following reasons as the most important for involving users in the briefing process:

- Ensure that new facilities are designed in accordance with the needs and intentions of the organisation
- Learn from good and bad experiences with existing facilities
- Ensure acceptance and appreciation of the new facilities among managers and staff

There is a need for further research in the role of the users in the briefing process and how to manage inclusive and continuous briefing with user involvement. There is also a need for research that evaluates the effects of user involvement for different types of users, processes, facilities and national cultures.

User Driven Innovation

According to von Hippel (2005), innovation is nowadays being democratized, and it is no longer just manufactures, but users of products and services that are innovating. In the traditional, manufacturer-centric model of innovation, the users' role is to have needs and the producer's role is to identify them and satisfy them by new products. In a user-centric model, manufactures invite lead users for usability testing and simulations, where the advanced users can find additional improvements for developing the next prototypes. Furthermore, he claims that most innovating users have characteristics of lead users - they are ahead of the majority of users in their populations with respect to an important market trend.

Ehn & Kyng (1987, in von Hippel, 2005) define user driven innovation as introducing a groundbreaking change - now innovation and design is not done 'with' nor 'for' users, but 'by' users! In the recent years, we have seen in some fields that it is truly the users, who are first to develop new consumer products, as the computer software and communication possibilities are steadily growing, resulting in user-centric or user driven innovation. The surprising empirical finding is that users often freely reveal their innovations. The practices

visible in “open source” software development were important in bringing this phenomenon to general awareness (von Hippel, 2005).

According to Danish Enterprise and Construction Authority (2010), User driven innovation methods can be divided into three groups:

1. Lead user approach – first mentioned by von Hippel, where lead users are gathered with the project team at workshops, make rapid prototyping, then R&D department develops the product further
2. Ethnographical approach – the aim is to find the needs, both known and tacit, by studying the users in their everyday situations, the used tools can be: observations, workshops, interviews
3. Participatory design /innovation - the users are co-designers, methods can vary and are chosen to fit the exact project

The recent shift to User driven innovation has very attractive qualities. Von Hippel describes two of them. First of all users can get precisely what they want by designing it for themselves. Secondly the innovation by users appears to increase social welfare. Nevertheless there are some challenges to obtain a widespread use of User driven innovation. The manufactures must be able to apply the needed fundamental changes. Moreover, the governmental policy and legislation should stop supporting the manufacturers-innovation only (von Hippel, 2005). Furthermore, von Hippel (2005) summarises the various qualities of User driven innovation in his book Democratizing Innovation, like this: “Users’ ability to innovate is improving radically and rapidly as a result of the steadily improving quality of computer software and hardware, improved access to easy-to-use tools and components for innovation, and access to a steadily richer innovation commons.” In addition to that, he predicts, that innovation by users will continue to grow, even if both users and manufactures have a constant willingness to invest in obtaining a precisely right product.

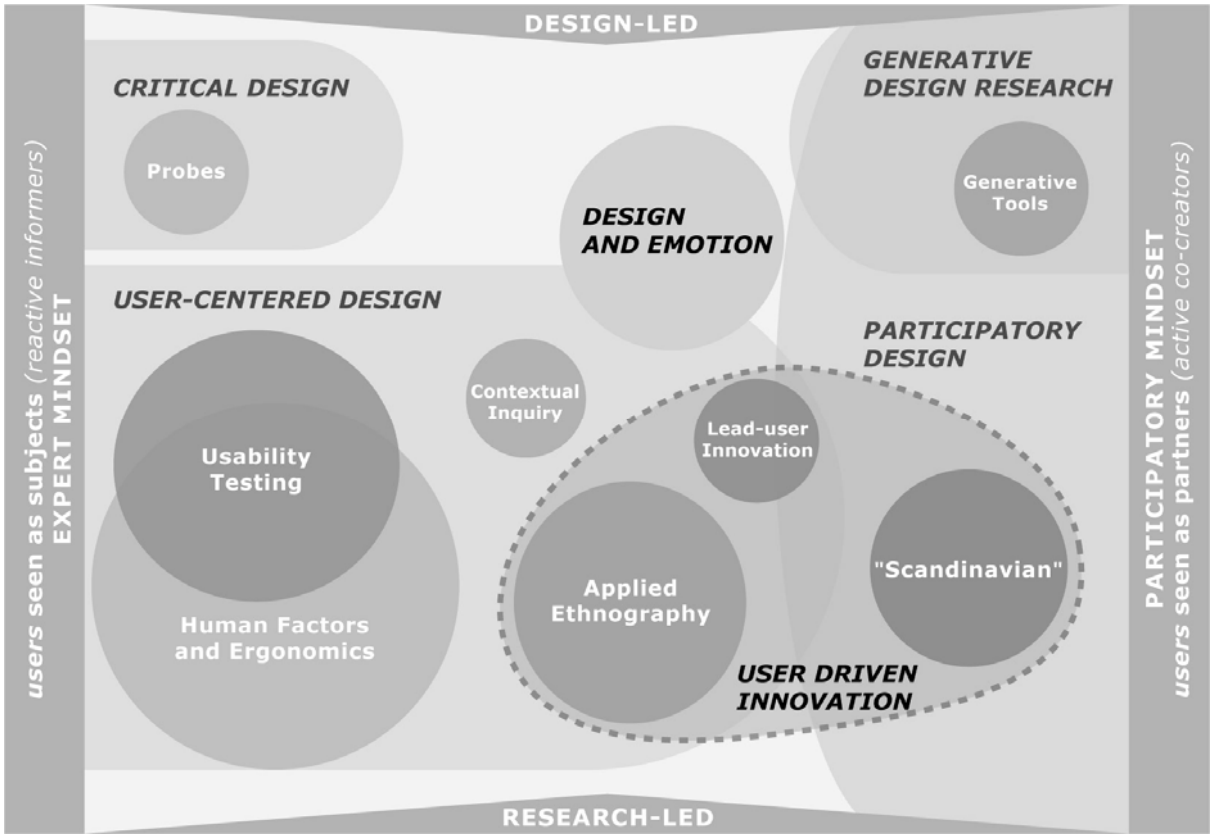
Research in user driven innovation has had a strong focus on products and software. As innovation by users is predicted to grow in the society, it is worth further examining of the possibilities of user driven innovation in the building sector. Furthermore, the different methods like workshops, rapid prototyping, simulations, interviews and observations can be applied and tested further in different stages of the design process.

User Involvement in Design

In recent years there has been growth and exploration of different approaches to design research. As some of them are complementary and others competing, the result was a confusing mess. Recently a visual map was presented by Sanders (2006) and Sanders & Chan (2007), which organises the landscape of design research and many of the approaches to user involvement, see Figure 3. The different approaches are positioned in the framework with two axes. The vertical axis is stretching from design-led to research-led, while the horizontal axis is stretching from an expert mindset, where users are informants and design is FOR people, to participatory mindset, where users are co-creators and design is made WITH people.

The largest area on the map is covered by the *User-centered design*, which is most developed according to the authors, and aims at developing products and services to better meet the needs of users. The approach is research-led with expert mindset. The main methods are *Human factors and ergonomics, Usability testing* and *Applied ethnography*.

Figure 3: Emerging trends in design research. Adapted from Sanders (2006)



Another large zone is *Participatory design*, which can be both design-led and research-led, and actively involves users throughout the design development. The origins date back to trade union movements in Scandinavia in the 1960s and later spread to other fields. For example the new trend was noticed in software design by Floyd *et al*. (1989), who described a couple of main characteristics of the new *Scandinavian approach*. The most important was the cooperation between developers and users, considered to be a crucial factor and getting methodological support. Furthermore, various forms of prototyping were used to provide technical support for the process of mutual learning. Users were getting help to progressively qualify themselves for the process. In addition to this the traditional participation, approaches were extended by adoption of two principles - mutual learning and designing by doing.

Mutual learning, also called co-learning means, that both users and developers are reliant on the mutual process of learning and communicating. *Designing by doing* means that experimentation and testing takes place already in early stages of a project, such as using fast prototyping and promoting communication and learning processes. Last, but not least a new concept of Co-creation arrived. Examples of the collective process, communication and co-creation of workplaces are described by Granath (1998). Moreover, Sanders & Chan (2007) add another characteristic to participatory design – "the use of physical artefacts as thinking tools throughout the design process". Those tools - boundary objects - have been explored by researchers as Clarke and Fujimura (1992), Granath (1998), Kjølle and Gustafsson (2010). Recent examples of further research on participatory design are Broberg (2009, 2010), Binder and Brandt (2008), Peek and Geurts (2010), Våland (2010).

Lead-user innovation, as described by von Hippel (2005), is located in the map as a small overlap between User-centred design and Participatory design. If the definition of User driven innovation is broadened, as by the Danish Enterprise and Construction Authority (2010), then the overlap is covering the Scandinavian participatory design and Applied ethnography as well – see Figure 3.

Three other design categories described by Sanders & Chan (2007) are worth mentioning: *Affirmative design*, *Critical design* and *Generative Design*. Affirmative design, according to Dunne & Raby (2001, in Sanders & Chan, 2007) "reinforces how things are now", conforms to the expectations and is the most used in design. Critical design rejects "how things are now" and provides alternatives to design and values. Generative design, on the other hand, focuses on creating tools for non-designers and empowering them to express their dreams for future or make their own alternatives to the current situation. Generative design is a part of the Participatory design zone, and is design-led.

It seems like there is a strong development of research in border area between User-centred design and Participatory design. Further research could explore the boundaries and the growing overlap of the two zones, as well as particular effects on specific fields, like the built environment.

COMPARISON OF APPROACHES AND TRENDS

The preceding section presented a number of different approaches of user oriented research. Research in relation to usability was divided in usability engineering with a focus on individual users of industrial products and IT-software, usability and accessibility with a focus on individual less able users of the built environment and usability appraisal with a focus on organisational users of the built environment. Usability appraisal is related to POE, but is distinguished by a stronger focus on feed-forward to the user organisation rather than feedback to the designers.

User involvement in briefing is specifically related to produce input into building design. User driven innovation is a broader concept coming from industrial product development with lead user innovation as a specific method. Participatory design is also a broad concept. When relating these concepts to the built environment, it seems important to distinguish between conceptual design and the physical design. The conceptual design focuses on the organisational needs of users and search for principal solutions to the configuration of functions and space. Briefing and user driven innovation can be part of this. Participatory design is more related to the physical design process.

Table 2 shows a comparison of these eight approaches in relation to purpose, typical setting of the user interaction, the place in the REBUS-model in Figure 1, and our estimation of their stage of development (status). We have as mentioned the introduction defined the places as Finding, Explaining and Developing. The five approaches Usability appraisal, POE, User involvement in briefing, User driven innovation and Lead user innovation all take a starting point in Finding and this is the main focus of POE, while Usability appraisal and User involvement in briefing also can include Explaining and Development, just like User driven innovation and Lead user innovation usually cover all three places. The three remaining approaches – Usability engineering, Usability and accessibility, and Participatory design – all have their main focus on Developing.

Table 2: Comparison of approaches of user orientation

Approach	Purpose	Setting	Place in REBUS-model	Status
Usability Engineering	Prototype testing of consumer products	Laboratory	Developing	Established
Usability and Accessibility	Design for disability, universal and inclusive design	Design office	Developing	Established
Usability Appraisal	Evaluation - feedforward (+ requirements and exploration of possibilities)	Existing facilities	Finding (+ Explaining + Developing)	In development
Post Occupancy Evaluation (POE)	Evaluation - feedback	Existing facilities	Finding	Established
User Involvement in Briefing - Traditional, Inclusive Usability	Define user requirements (+ dialogue and approval of building design solutions)	Existing facilities (+ design office)	Finding (+ Explaining + Developing)	In development
User Driven Innovation	Develop new products, processes or services and new or existing building design	Observation and interviews in existing facilities, workshops and/or innovation camps	Finding + Explaining + Developing	Emergent
Lead User Innovation	Develop new products or processes	Workshops and prototyping in R&D department	Finding + Explaining + Developing	In development
Participatory Design	Develop new or existing building designs in a dialogue process	Existing facilities, workshops and design offices	Developing	Established

The development of the user oriented approaches show two completely opposite trends. One trend is towards increased generality were the facilities should be usable for everybody and/or for changing purposes. This is expressed in the demands for universal design and adaptability. The other trend is towards increased specificity were facilities should be usable for specific activities. This is expressed in the focus on for instance optimal learning environments, healing architecture and housing adaptations for elderly. A way to compromise these divergent considerations could be to make the basic building dimensions and common areas like access, circulation and amenity areas as general as possible and make the specific activity areas as fit for purpose as possible.

SUGGESTIONS FOR FURTHER USER ORIENTED RESEARCH

This paper suggests that further research in the field of user orientation of the built environment is strongly needed. The literature review shows that the different approaches

vary in theoretical foundations, methodologies and stage of development, but they are in most cases not incompatible and they use many similar research methods. Further research should focus more on direct interactions with and involvement of users and mostly qualitative research methods are needed. It is important to distinguish between different types of users and apply methodologies involving users both as individuals and in groups and organisations.

The following list a number of suggestions for future research. The suggestions are listed according to the places in the REBUS-model in Figure 1 as used in Table 2. Some of the suggestions are based on the REBUS-report (Blakstad et al., 2010) as indicated in brackets.

Finding

Approaches with focus on evaluation of the 'as is' situation could benefit from research in the following areas:

- Understanding building clients as organisations (strategic/tactical/operational)
- Role of the users in briefing etc. (REBUS)
- Evaluation of the effects of user involvement
    - For different types of users, processes, facilities and national cultures
- Management of the processes of evaluating usability (REBUS)

Explaining

Approaches with focus on creation of new understanding of the 'as is' situation and how it can be changed to a new 'to be' situation could benefit from research in the following areas:

- Knowledge management of transfer of usability data
- User involvement and tacit knowledge
- Usability briefing
- Investigation of feedback and feed-forward (REBUS)
- IT support of information flows (REBUS)

Developing

Approaches with focus on creation of a new 'to be' situation could benefit from research in the following areas:

- Management of continuous and inclusive briefing
- Briefing as creative exploration of possibilities
- User driven innovation in refurbishing, renovation and housing adaptations
- Agile management of participatory design
- Simulation as method for user driven innovation
- Management of decisions on strategic, tactical and strategic levels
- Management of user experiences

It should be stressed that this paper and these results are part of work in progress and does not intend to cover all aspects of user oriented research in the built environment. Thus, it should be seen as a contribution to the further development of this important area of research.

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TIME-GEOGRAPHIC VISUALISATION OF STAKEHOLDER VALUES: A CASE STUDY OF CITY RELOCATION

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Successful construction projects include stakeholder management. However, it still is difficult to communicate stakeholders' interest in the early planning processes of complex building projects due to different stakeholder groups and their conflicting values. The question of how city relocation processes are influenced by stakeholder values is investigated in a case study. Secondary data from municipality public information and two in-dept interviews made it possible to analyse stakeholder's action and their values in a city relocation process over time. A time-interest-power model is developed from the analysis. A city relocation project will be influenced by stakeholder's power and interest. However, power and interests are influenced by the perceived values for the different stakeholders. Therefore, communication is important in order to identify values and needs of the many stakeholders in the city relocation processes. One problem for the decision makers is the development of good communication channels especially with the citizens.

KEYWORDS: city relocation, stakeholder values, time-geographic perspective

INTRODUCTION

Previous studies have shown that stakeholders actively engaged in construction projects may positively or negatively affect the result of the project (Olander & Landin, 2008). Identifying stakeholders by mapping and visualising their influence on project management processes may have a significant impact on the success of projects as well as on project management according to Walker et al. (2008).

A model for analyses of city relocation processes and their influence by stakeholder values with a time-geographic perspective is argued to be of interest for project management. With a city relocation process we describe the complexity of city planning processes ongoing parallel with design and construction processes conducted by actors. Stakeholders influence is investigated in terms of interest and power followed by a discussion of methods for analysing stakeholder values with a time-geographic perspective. Data has been collected within a case study to develop the model discussed in the final section of the paper.

INTERESTS AND POWER

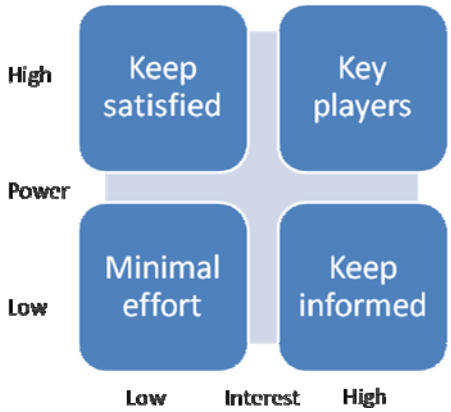
Stakeholders can be identified with different theoretical perspectives. However, these perspectives are in some sense conflicting with each other. One perspective is based on stakeholder roles. Winch (2002, p 67) suggest that stakeholder groups should be described as

internal and external stakeholders depending on their relation to the project or organization. According to Winch (2002) internal stakeholders have an active role in the construction project acting as clients, financiers and users on the demand side. External stakeholders on the other hand, act as architects, engineers, contractors and materials suppliers, on the supply side. The research presented by Walker et al. (2008) supports this view by describing how upstream, downstream and external stakeholders may influence internal stakeholders, i.e. project teams. Upstream stakeholders include end users and paying clients organisations. Downstream stakeholders include suppliers and subcontractors. External stakeholders are all groups that in one way or another will be influenced of and by the project (Walker et al., 2008).

Another perspective is when identifying stakeholder groups based on their power influence on the project or organisation. Chinyio and Akintoye (2008) argue that it is important to quickly identify key stakeholders in the early phase of a construction project, i.e. those stakeholders with high power and urgency. Power can be recognized more easily by identifying the one who will authorize a certain key decision, because the urgency of stakeholders changes (Chinyio & Akintoye, 2008). Johnson and Scholes (1999) argue that stakeholder's relative importance for organisations should be investigating by stakeholder groups' degree of interest and power related to the specific organisation. Olander (2006) investigated stakeholders' relationships focusing on roles by identifying their level of power and interests.

Johnson and Scholes (1999) presented a power interest stakeholder map which can be seen in Figure 1. This approach is an attempt to explain the influences of different stakeholders within in a project in relation to interests and power, e.g. a stakeholder high interest and power are defined as key players. Stakeholders with high interest but with a low power impact need be informed of the progress and activities of the organisation or project. Stakeholders with low interest and low power are of minor interest but stakeholders with low interest and high power need to be taken care of. Olander (2006) argued that one problem with the approach is that the scale is limit to either low or high power and interest values.

Figure 1: The power-interest stakeholder map. Source: Johnson and Scholes (1999).



For all groups it still is important to investigate if their level of power and interest change over time due to activities related to the specific categories.

Even more complicated are the questions regarding city relocation processes and how the various numbers of related and complex construction projects performed during different

time periods are influenced by stakeholder values. According to Freeman (1984) and Mitchell et al. (1997) some stakeholders have a strong influence on society, i.e. legitimate demands and power to use their values when putting pressure on politicians and private and public organizations. Hence analysing changes of stakeholder impact over time, needs a time-space dimension and we suggest a further investigation of how to analyse stakeholder values with a time-geographic perspective.

STAKEHOLDER VALUES: A TIME-GEOGRAPHIC PERSPECTIVE

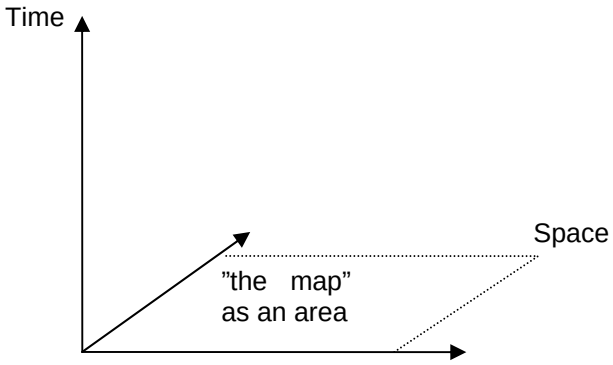
The value concept in construction is in general described in terms of quality referring to product, services, functions, etc. which fulfil the client's needs and requirements according to Wandahl et al. (2007). Saxon (2005) defines value as it is what you give in relation to what you get and it is personal and not an objective fact. Wandahl et al. (2007) argue that values are principles by which we live. Hence, values are visualized by the individuals' habits and manifested in society by people's attitudes presented by Banyard and Hayes (1994: 378-399). According to Barrett (2007) stakeholder values should be managed and balanced in the building processes. Managing stakeholder values also gives an understanding of the business concept according to Saxon (2005). Public construction clients have described their values of public building project for cultural activities, i.e. Houses of Culture (Laurell-Stenlund, 2010). These values were generally described as human beings expectations grounded in personal beliefs, social norms and rules developed in society or related to specific groups, i.e. they are culturally conditioned.

The cumbersome matter is how city relocation processes are influence by stakeholder groups over time at different locations. Out of this point of view we suggest a time-geographic perspective as one way of developing a model for analyses of stakeholder values including time and space.

Time-geographic builds on a holistic approach of how projects are fulfilled by the resources that the actors have access to and constraints they experience (Hägerstrand, 1985; Thrift, 2005). With a time-geographic perspective we analyse resources and constraints for activities in time and space, which are considered inseparable parts of the time-space dimension. The time-geographical view of the world combines the view of objectivity in natural science with the social science view of subjectivity (Hägerstrand, 1976). The approach has become a foundation of different forms of analysis such as innovation diffusion studies (Rogers, 1962/2003) as well as everyday life in households (Ellegård & Wihlborg, 2001).

Our view on the time-geographical analysis is on the actors' roles, arrangement of resources and constraints in time-space. The use of time and space is fundamental for all social and natural scientific processes, but still not commonly integrated as an explicit precondition for scientific analysis. Hägerstrand's ambition was to create a notation system for making processes (irrespective of whether they were human or non-human) visible in the time-space. As a geographer his starting point was the map as a horizontal illustration with time added as a dimension emerging vertically above the map, and he thereby developed the now classical illustration of time and place (Figure 2).

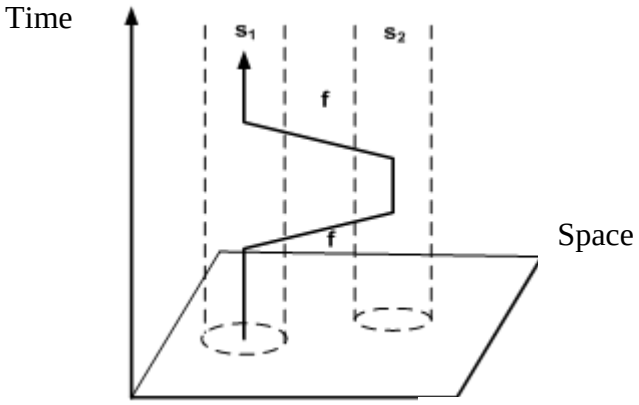
Figure 2: The traditional time-space illustration. Source: Hägerstrand (1953).



We suggest that the time-space notation system (Figure 2) could be used to analyse processes in time and space. In the time-space trajectories, e.g. different actors' movements, can be illustrated. By identifying stations in time-space, location for specific activities and the relation between them can be illustrated (Hägerstrand, 1953).

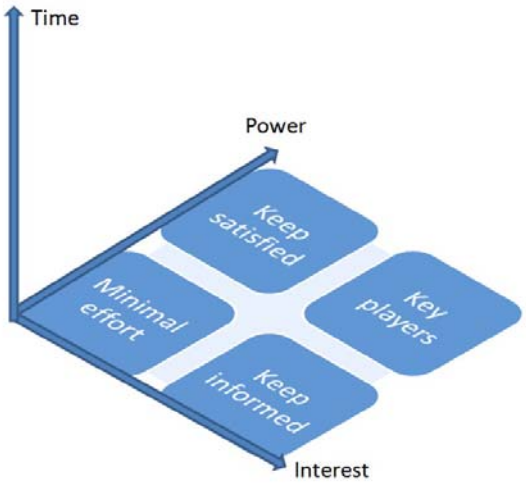
In Figure 3 individuals actions are illustrated by defining two stations indicated by **S**, which may be for example a home and a school (Hägerstrand, 1970). The thick line **f** is a trajectory of an actor, leaving S1, visiting S2 and returning to S1. The two stations visualised in Figure 3 could also describe trajectories in virtual spaces, e.g. movements between interest and power.

Figure 3: Stations in time-space. Source: Hägerstrand (1970).



In Figure 4 the space is presented as an interest-power stakeholder map (Johnson & Scholes, 1999) illustrate movements between stakeholders' interest and power with a time perspective. By illustrating different actions or activities in a time-space dimension the change between interest and power should be possible to visualize, see Figure 4. There may be many reasons for the outcome in time-space, but they all fall back on the basic issue of who was actually in possession of the time-space when a specific process took place, i.e. who has the power and who is able to influence on the action.

Figure 4: A time-interest-power stakeholder map (developed from Johnson & Scholes, 1999 and Hägerstrand, 1970).



RESEARCH METHOD

Our research method, a case study, is based on Yin (1994) arguing that case studies are suitable when studying complex processes in general. The case study was chosen based on its possibilities to include different types of data collection and analysis methods within one single case.

Case selection

Our case is the city relocation processes taken part in Kiruna which is causing changes in the urban environments by phasing out and the creation of new urban areas. The city relocation in Kiruna is complex causing high pressure on several construction processes taking part during a long time period.

The selected case is a part of a study within the Nya Giron project which is a European Union research financed project for the relocation of the city of Kiruna. The project is a multidisciplinary project consisting of a research cluster with six different research groups from Luleå University of Technology and the Municipality of Kiruna. Focus area of the project is sustainable development within infrastructure and urban environments. The aim of the projects is to create sustainable and innovative technical solutions which include environmental, economical and social aspects for the relocation in Kiruna.

Secondary data

Data has been collected by using secondary public data from the municipality. This was mainly public information data collected from the website of the municipality and it was sorted and analysed by the authors.

Interviews

Interviews were carried out with the project leader and the town architect, representing the municipality's interest in the city relocation. By selecting the project manager for the first interview and the town architect for the second, we were able to get a broad picture and deep description of the overall planning processes. The selection of the respondents is based on our view that the project manager represents the municipality as a client of a city relocation project. The town architect represents the construction professionals within the public

administration organisation, with a professional architectural knowledge and the city planning administration. The interviews were performed in a semi structured way, recorded and transcribed.

Data analyses

From the secondary public information data, a time liner with critical decisions, activities and processes was developed. The activities were also verified by the interviews following a qualitative data analyse method described by Miles & Huberman (1994). The power-interest stakeholder map (Johnson & Scholes 1999) was used in the development of the analysis model with a time-geographic perspective. Key stakeholders were first identified by analysing the official webpage of the municipality. We then made a stakeholder map by identifying different stakeholder groups that we thought were relevant to investigate suggested by Johnson & Scholes, (1999) and Walker et al. (2008). Mapping the stakeholders also lead to our decision to analysis of one stakeholder group and their relation with other stakeholders when developing an analyse model.

We developed our interview guides based on stakeholders' interest in the city relocation process as well as on their power to act within these processes. When we developed the interview guides we treated the municipality as one single organisation representing one stakeholder group. Based on this view we developed the interview questions from factors influencing change processes described in the change kaleidoscope developed by Balogun and Hope Hailey (1999), e.g. time, scope, preservation, diversity, capability, capacity, readiness for change, power; as well as on questions specific regarding stakeholder values. Our purpose with collecting data from the two respondents regarding these changes factors was to ensure that we got a satisfactory description of the city relocation processes and the factors influencing this process out of one stakeholder perspective, the municipality's, see Appendix were the interview guide is summarized.

The transcribed data files together with secondary data files were exported to the qualitative data analysis tool Nvivo (QSR N6, version 2002) for further analysis. Nvivo allowed us to create categories from theory with focus on one stakeholder: the municipality, the change processes and on stakeholder values. We analysed the data from the interviews and secondary data by coding the data into the categories. The data analysis was the performed with a grounded theory methodology perspective developed by Glaser and Strauss (1967) and Glaser (1992) where new categories were developed from analysing the data within the categories created from theory.

A STUDY OF CITY RELOCATION

In this section the analysis of the city relocation processes is presented after giving a short introduction to the city and the need of city relocation.

City history

Due to rich ore deposits in the northern part of Sweden, the company LKAB has come to a critical point in their activities. After more than hundred years of mining activities, together with their mining technology the company has reached deep ore deposits stretching under the central city of Kiruna. People have been living in the area over 6000 years. The Lappish culture and the Finnish culture have been together as long as we know. The first settlers and mineworkers came during the 1600-century. However, Kiruna or *Giron* the Lappish name of the city, is a young city, once built on wealth created by the mining activities in Kirunavaara

together with the first company directors', Hjalmar Lundbohm, visions and efforts of creating a modern ideal city. The city, just 100 years old, was built on the foot of the mountain with a special street system hindering the cold winds to blow thru the city. Some buildings are also specially mentioned for their architecture, e.g. the church at Kiruna, which was voted Sweden's most beautiful building in 2001 and the City Hall, which got the Kasper Salin price for Swedens most beautiful public building in 1964.

Need of a city relocation

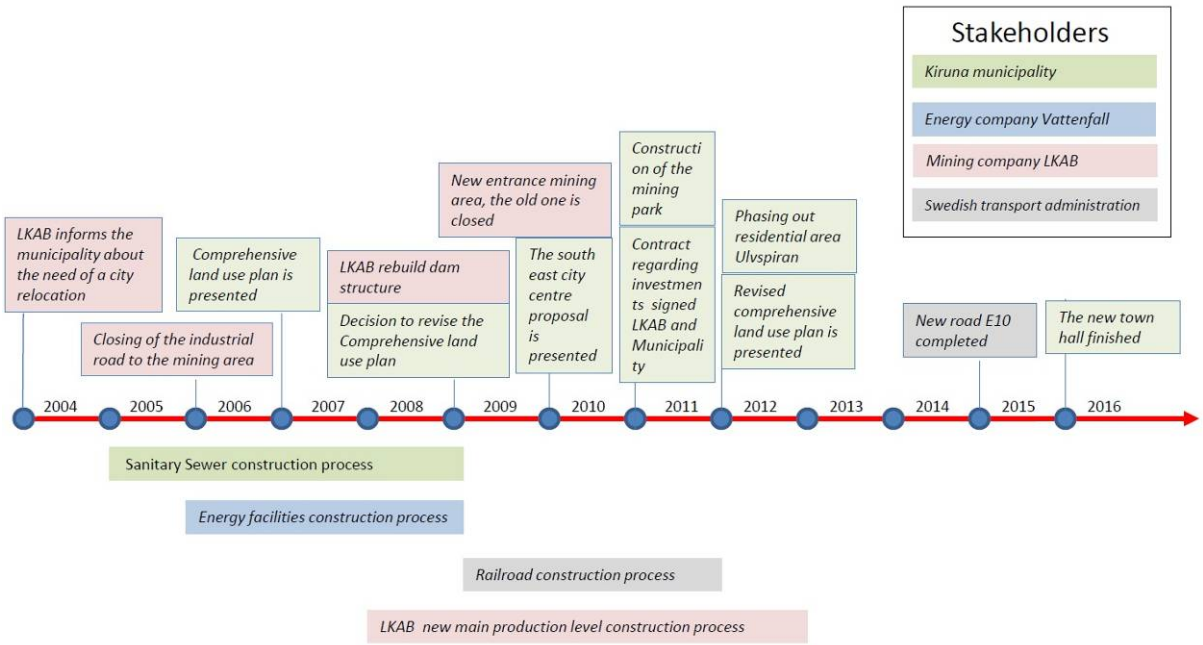
In 2004 the mining company LKAB informed the municipality with a formal letter. It was important for the company to continue their future mining activities and that these activities would affect the city and its buildings. Continuing the exploration of the ore funding, if possible, solutions of moving critical blocks in the city as well as developing the city into a new direction are a must. The public administration received the letter and handed over the question to the politicians according to the project manager:

"It was the start of our journey. The first thing we noticed [the public administration] was that we needed the opinions from the politicians and their view on Kiruna. That is, we needed a program for the city with the politicians' values that we, the public administration, could relay on." Project manager 20101116.

Results of analyses of stakeholder influence and values

A time liner is presented in Figure 5 showing different milestones and construction processes related to a city relocation process in Kiruna. Milestones are defined as important activities and decisions that have or will be carried out by the different stakeholders.

Figure 5: Construction activities and decisions and processes with milestones of a city relocation project



Stakeholders as decision makers and informants

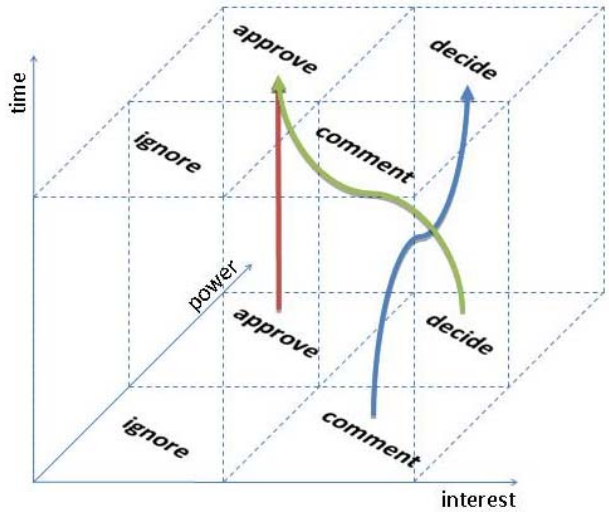
By analysing activities performed within the Kiruna case, i.e. city relocation processes consisting of different activities, stakeholders' involvement in the activities and their power of making decisions have been analysed. The results from the analysis show that stakeholders have different roles in the city relocation process closely related to their power and influence in accordance with previous studies. Key players are in the position of decision makers for all kinds of activities related to the city relocation processes. Stakeholders with high power and lower interest in one specific activity or construction project, still have the power of giving their approval to the decisions made, i.e. stakeholders that should be kept satisfied need to be satisfied due to their power position in the city relocation project, and thus they put a pressure on the decision makers. Stakeholders that need to be kept informed, e.g. interest groups. Interest groups do not have any power of putting a direct influence on the decision makers, however their interests in specific activities taking part in the city relocation process is very strong. This interest gives the interest groups a specific influence. The decision makers need to consider this influence by informing the interest groups before the decisions are made. Finally stakeholders with low power and low interest, in our case the citizens with no interest in specific activities and construction projects performed in the early phases of the city relocation process.

Our analysis has resulted in defining the role of key players as decision makers; keep satisfied is developed into approval; keep informed is developed into comment and minimal effort is developed into ignore.

Shift in level of power and interest over time, due to stakeholder values

Figure 6 illustrated our results from the analysis of stakeholders' interest and power over time within the time-interest-power stakeholder map.

Figure 6: Results from analysis of stakeholders interest and power over time within the time-interest-power stakeholder map.



In Figure 6 the green colored trajectory is one example of how a stakeholder can change role. The example illustrates the process of the energy company. This is related to that the company already finished their construction process in the city relocation. A possible shift in power and interests is a reasonable outcome. In order to manage city relocation process there

is need of managing the different stakeholders' right in relation with time. In that process communication is vital in order to satisfy and inform stakeholder groups.

From initial analyses of stakeholder groups and their values over time, we can see that there is a shift in their level of power and interest in the city relocation process. The municipality expressed that they initially had a plan of saving the city by moving the city to the new location. Firstly the municipality thought it was possible to keep the main infrastructure, such as the railway and the main road and only move the buildings. After the mining company found new ore deposits, this no longer was an option. The municipality had to develop new infrastructure solutions in the community by initiating sanitary sewer construction processes. Studies of how it should be technical possible to move valuable buildings were accomplished resulting in very expensive solutions and in some cases also technical impossible. One argument from an architectural perspective has also been that some of the identified unique buildings are close connected to the place were they are built. Thus moving for example the City Hall should make the building less attractive.

We can see that traditions from early years still live imbedded in the city articulated by the municipality's vision of developing the "new" city influence by the spirit of the first company directors', Hjalmar Lundbohm, visions and efforts of creating a modern city. The municipality is acting as a decision maker. The municipality makes the decisions regarding the infrastructure and rebuilding public houses, influenced by the mining company's power of exploring the land resources.

DISCUSSIONS AND CONCLUSIONS

An analysis of stakeholder power and interest, driven by values within a time-geographic perspective has been presented. The time-power-interests stakeholder model is used to visualize and explain how different stakeholders' interest and power change over time. This approach connects stakeholder's interests-power with time and space relationships.

Our main conclusions are that when relocating a city, stakeholder roles influenced by their power and interest are not only related to specific activities and construction processes, they are also related to stakeholder values. Thus, it is important to make these values transparent for the decision makers through proper communication. One of problem discovered for the decision makers in the case study is the development of good communication channels especially with the citizens. Little feedback was found from this group in the secondary data. The potential benefits of including these stakeholders groups are therefore high.

To support communication and decision making processes needs information of future activities, both in and time and space, to be disseminated to all stakeholders. This is a major challenge in the city relocation project studied, where the power-interests map is continuously changing over time. Therefore time-space information needs to be created, shared and used in a simple and efficient way to handle the different stakeholder's values, power and interests.

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APPENDIX

Questions to project manager and town architect

Interviews with project manager and town architect were conducted on the 16th and 17the November 2010 and took approx. one hour.

Presentation of the respondent

What is your profession and what are your working tasks in the municipality? For how long have you been working for the municipality? How your professional career does looks like?

The planning processes

Describe your image of the planning processes in Kiruna as it looks today. What is good and what is less good.

The organization structure of the planning office

Describe the organization of the planning office. What is good and what is less good in current structure? In what ways does relocation of the city influences the organizational structure?

City relocation and its stakeholders

Describe the different change forces of the municipality? What is the value of the city relocation for the municipality? For a successful relocation change, which are the main internal and external stakeholders within the municipalities, which interests should be reviewed, expressed, adapted, agitated? Show mindmap. Kiruna Kommun (municipality), LKAB (mining company), Trafikverket (Swedish transport administration), Vattenfall (power company). Describe how you perceive the different stakeholders change forces behind the city relocation. Describe how you perceive the value of the city relocation for different stakeholders

Power configuration between different stakeholders

Who has the legitimate power in the municipality? How much acting space has the municipality to pull and push the transformation? How do you perceive the responsibility distribution between the municipality and the other stakeholders? Is it a dividing line between how you want to influence and how you can influence and how do you handle that. Describe how your own organisation and other stakeholders influence you. What are the main difficulties for your work within planning for a new Kiruna.

Questions regarding visualization model

In what way do you think visualization can be used for decision making and communication? What are the challenges in that? How do you think that virtual models can be used to support visualization in decision making and communication? What are the difficulties to use a variety of visualization in the city relocation? Do you have any ideas about how the planning can be improved? What kind of feedback do you get for such ideas within the organisation? Your response/responsible/relations to colleagues/acting space.

INVOLVING END-USERS' EXPERIENCE AND AWARENESS OF USING BOUNDARY OBJECTS IN BRIEFING

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This paper addresses the process of briefing, wherein the translation, transformation, and absorption of information about needs and requirements is transferred from client to architect. The aim of our work has been to test and develop boundary objects, involving users in briefings to gain a higher level of common understanding between the actors. Our hypothesis is that end-users' experiences and awareness of how they work within and utilize space are essential in developing new workplaces. The chosen methodology is an explorative case study, limited to and conducted as action research in a briefing process related to a new office solution in a Norwegian context. Different tools, methods, and artefacts were used and tested in order to understand the work processes, cooperation, and relationships between the users. The purpose was twofold, namely to enrich the information to be transformed in the brief and to test the effect of some forms of boundary objects which served as temporary bridges during the translation process, enabling equality in agreements and common understanding between the actors involved. The research contributes knowledge of how different forms of boundary objects affect a briefing process, involving users in the action.

KEYWORDS: briefing process, end-users' awareness, actors, boundary objects

INTRODUCTION

Workplaces are constructed to support users when performing their individual and collective activities. Theory and practice in workplace design highlight the importance of involving end-users and their experiences in briefing and workplace design (e.g. Kernohan et al. 1992, Horgen et al. 1999, Våland 2009, 2010, Blyth & Worthington 2010). The main purpose of user involvement is to ensure a fit between the space that is designed and the activities which will take place within it. However, the theories of user participation also have more democratic origins. In some Scandinavian countries, the involvement of users in workplace changes is even defined in legislation, such as in Norway, where it is regulated by The Working Environment Act (AML) (AD 2005).

However, users may also be involved for more strategic reasons. It has been argued that space may be used strategically to promote and support value creation as well as fulfilment of objectives in a user organization (e.g. Becker 2004, Vischer 2005). In this perspective, user participation is not only concerned with end-user involvement in developing a future workplace but may also be used for developing the user organization in parallel with design

and construction of the new workplace, and workplace innovation may be used as a tool for organizational development and change (Gjersvik & Blakstad 2004a, 2004b, Kelly 2005). Harrison et al. (2004) label this 'workplace change management'. The perspectives we have mentioned so far promote the idea that the user organization, both management and end-users, should be involved when defining and developing their new workplace, thereby representing the demand side in briefing and design.

Communication between end-users and managers in the user organization (demand) and Facilities Management (FM), building owners, and consultants (supply) responsible for developing briefs and designs is important for improvements in workplace design. In order to facilitate the translation from experiences into demands, and later into briefs and design, there is a need for methods and tools for communication. Boundary objects are 'objects that become shared foci for the attention and explorative activities of people with initially different interests, expertise and language' (Carlsen et al. 2004, p. 229). Our aim in this study has been to develop and test a set of boundary objects for participatory processes in office briefings. In this paper we present a set of boundary objects that has been developed to aid and facilitate the communication, translation, negotiation, and interaction between the demand side (i.e. users and user organization) and the supply side (i.e. consultants developing briefs and designs). The boundary objects were developed and used in an experimental case study, conducted as action research. Our research objectives were to:

- Develop and test a set of boundary objects for user participation in the briefing for new office buildings

- Investigate how boundary objects impact on users' experiences and awareness of their needs and of their present and future workplace.

PARTICIPATORY PERSPECTIVE ON BRIEFING

Whenever an organization's work processes change, the workplace may be rethought to fit the shift, and hence a demand for change in the physical environment may emerge. Accordingly, whenever an office is redesigned and changed, a rethinking of the workplace within may occur. Relationships between work processes and space, technology, and organization need to be identified. How space matters in supporting an organization's goals and objectives has been in focus in some studies in the field of architecture (e.g. Duffy & Hutton 1998, Peña & Parshall 2001, Mosbech 2004, Blyth & Worthington 2010). Blyth and Worthington (2010, p 3) define the briefing process as 'an evolutionary process of understanding an organization's needs and resources, and matching these to its objectives and its mission ... [it is] the process by which options are reviewed and requirements articulated [and is] produced at key points in the project formalizing decisions and instructions'. The briefing process is about problem seeking, and problem formulation and solving. It is about conducting transformation in a process of briefing through three main phases in a building project: pre-project, project, and post-project. The outcome and product of this process is a brief document, which Nina Ryd (2004) has defined as 'a carrier of the client's demand'.

A combination of hard and soft data is essential information to be applied to the brief in order to contribute to success in design. Nevertheless, in order to provide a systematic and controlled process during stages in a project, good briefing implementation is the key to avoid

expensive mistakes or inferior results. Many feasible solutions and thus conceivable interpretations of the requirements are to be defined. This may lead to confusion and result in failure to meet essential needs. According to Blyth and Worthington (2010), good briefing relies on a dynamic interaction between individuals and teams in organizations, and is concerned with the communication and management of information within and between them. On the one hand, due to cultural differences and different languages the same words may be attributed to different content and understood differently. On the other hand, due to building projects' long development and construction time, users' involvement in the early stages may serve to identify challenges in future work processes and work types.

Another important aspect of end-user participation is that it may become as much a significant process to the employees as to the leadership rendering ownership and engagement (Fristedt & Ryd 2004). By engaging end-users in active participative roles in the briefing process, in which they can exchange experiences as experts in own work processes, their engagement will grow parallel to their awareness. The users' perceptions will modify as a result of recognition implied by communication and interactions in the iterative process (Våland 2009, 2010). Hence, users will more consciously be enabled to contribute to clarifying the demand and to negotiate. Recent research has highlighted the importance in the experience economy of users being able to participate innovatively and creatively (e.g. Pine II & Gilmore 1999, Marling & Zerlang 2007). In this perspective, boundary objects may become useful for bridging the gap by assisting the translation process and assembling the human and material elements, which are essential in a briefing process (Bendixen & Koch 2007).

Boundary objects as bandwagons of the users' demand

To ensure a good balance between participants in dialogues and negotiations in a briefing process it is necessary to resolve any dilemmas that actors face in participatory processes. The concept of boundary objects contributes by de-emphasizing the distinctions and the imbalanced power structure between the actors with initially different skills and cultural background, interests, and points of view. The term 'boundary objects' was introduced by Susan L. Star, a researcher from the field of the science of technology and society, with reference to how language emerges in cooperative work between groups or communities of practice. With respect to actions, boundary objects are at 'once temporal, based in action, subject to reflection and local tailoring, and distributed throughout all of these dimensions' (Star 2010, p. 603). Contrary to ANT (actor-network theory), which focuses on the imbalance of power that often occurs between participants in a translation process (Latour 1987), the term 'boundary objects' focuses on the collective efforts which raise equality and stabilize relationships between participants. It describes the shared objects, artefacts, tools, models, and methods which, through further development, jointly establish a common context and create a common understanding across community boundaries. Hence, the quality of the objects in the material and pragmatic sense lies in the plasticity which renders it possible to adapt local and individual needs, yet remain robust enough to contain a common identity across social worlds (e.g. Star & Griesemer 1989, Fujimura 1992, Bowker & Star 1999, Kjølle et al. 2005, Kjølle & Gustafsson 2010). In their early study of actors in Berkeley's Museum of Vertebrate Zoology, Star and Griesemer (1989) identified four different forms which boundary objects might take. These are listed in Figure 1.

Figure 1: Four different forms of boundary objects identified by Star and Griesemer (1989)

Repositories	Standardized forms	Ideal types	Coincident boundaries
Ordered 'piles of objects' which fit problems of heterogeneity across the communities.	Intended to be a method for common communication. The instruments can be transported over a long distance and retain the same information.	Defined as symbolic means for communication and cooperation. They can be regarded as adaptable, since they are able to guide all divergent actors equally.	Common objects having the same boundaries, but with divergent internal contents.

THE CASE STUDY: OPCENTRE

OpCentre is an operations centre located in mid-Norway, with responsibility for safe railway communication on all national railway lines. The centre is a knowledge-intensive organization concerned with having a good infrastructure, collaboration and knowledge sharing among the employees, accessibility, quality in work, and strategic business processes. At the time of our study, the employees were divided into four divisions: the Management Unit, the Operations and Maintenance Centre, the Support Centre, and the Network Supervision Centre.

The number of employees in the operation centre had increased substantially in the three years since the company was established, and hence it had reached a situation where the office was about to become too small for them. The expansion of the organization was expected to continue. Due to the demand for more space, the centre needed either to enlarge the existing office or to move to another location. The leadership of the operation centre wanted to take the opportunity for change to focus on how a new office solution could support their present and future work processes, knowledge sharing, and teamwork among the staff. In addition, the management's defined objectives consisted of organizational issues, such as the company's profile, its identity and image, and cultural aspects due to stability and recruitment. To support them in the pre-project phase with a focus on preparing the development of the brief, two SINTEF researchers were engaged to manage the briefing process. The two researchers, namely the authors of this paper, executed or managed the overall arrangements or activities described here, with the exception of the pre-occupancy evaluation which was carried out by other researchers at SINTEF.

RESEARCH METHODS AND DESIGN

In the project we were involved in 'real life research' (Robson 1993), and had to accept the challenges that this posed for the research methods and design. The chosen methodology was an explorative case study (Yin 1994), conducted as action research. The case was the briefing process of new workplaces for OpCentre. The researchers acted as consultants in the briefing process, and the scope and focus of the study was twofold: to develop the brief, and to develop and test boundary objects for briefing. The cogeneration of knowledge was the main aim in action research, highlighting the importance of learning and reflection both for 'insiders' and 'outsiders' (Greenwood & Levin 1998). The researcher and the participant both acted as action researchers.

The rebuilding project was carried out between December 2007 and November 2009. The pre-project phase that we were involved in was finished in September 2008. The actual interventions were performed together with the case organization. Action research is often described as a cyclical process with five phases: diagnosis (define problem and cogenerate

knowledge), planning and take action, and finally evaluation and specification of learning (Susman & Evered 1978, Greenwood & Levin 1998). The survey carried out prior to the project is planned to be repeated after approximately one year of occupancy in the new office. The further evaluation will also consist of interviews with a number of end-users, the manager, and the architect. The results of the pre- and post-evaluation will provide management and the research project with data on the effect of the process and the new office. In this paper, we will report on the actions that were taken and the boundary objects which the participants used. The results of the evaluations will be reported in a separate paper.

THE BOUNDARY OBJECTS USED IN THE PARTICIPATORY PROCESS

In the development phase of the project the research team performed a screening of available tools and arrangements for participatory briefing (see for example Peña & Parshall 2001). In earlier projects (e.g. KUNNE, a Norwegian knowledge network and portfolio of research projects) several methods had been used, including focus groups, archetypes of work, cultural mappings, and posters with users' photographs (Gjersvik & Blakstad 2004a, 2004b). In KUNNE we also used PowerPoint (PPT) presentation as 'catalogues' which described different work environments and settings. The team also considered other methods such as cards with pictures for association (e.g. as used by DEGW Ltd. in London, and integrated design methods such as café gatherings, e.g. Brown & Isaacs 2005). The process of using animals as metaphors to describe individual work style and relation to territory was used also in earlier education and development projects at NTNU and SINTEF (Hansen et al. 1999).

For the final selection of methods we identified three different purposes and sub-processes: enhancing awareness, defining objectives, and constructing concepts. The resulting set of methods was used because they were believed to have the potential to serve as boundary objects which could be developed during the briefing in interaction between different user groups and researchers. The different BOs were named according to the expected outcome.

In the project the BOs were used in an iterative process with changed character during the process. There was a major focus on the organization and the soft values in the beginning, followed by increasing focus on the specific requirements of the physical environment, wherein the building was one of several contributory factors. The descriptions of the activities presented in the following are listed as they were performed in chronological order and not in relation to one of the three processes. Four of the different boundary objects developed in this study are shown in Figure 2.

Before the briefing seminar

A. Background materials

Background materials were provided by the leader of OpCentre through his narratives and accounts and also found in archived documents relating to the organization. The information was concerned with, for example, the history of the centre, and facts and details regarding structure and departments. In our first meeting, the leader gave an introduction to the company, supported by a PowerPoint presentation which gave an overall summary of the relations, lines, and structure within the organization. In addition, we collected relevant

information concerning the building, such as the numbers of rooms, the amount of space (m^2) in the existing office, and architectural drawings including plans and sections.

B. Preoccupancy evaluation

Before moving out of the old facilities a web-based evaluation survey was conducted covering several topics, such as individual requirements, learning, and knowledge transfer and interaction among the staff. The questions in the survey were formulated in accordance with the employees' relations to the existing physical environments, focusing on topics such as individual needs at work, knowledge transfer, learning and interaction, indoor climate, aesthetics, functionality, furniture, and internal environment.

The briefing seminar

In order to start the process and to enable the users to participate in the process of briefing we facilitated a one-day introductory workshop for all users. We gave them several exercises and activities to perform, both individually and collectively, which had to be solved during the course of one day. To reach the workshop, they had to travel by train for three hours, and during the trip they had to carry out two activities, C. and D., which are described in more detail below. Activities E. to H. were carried out during the workshop.

C. Description of current individual work processes

The activity consisted of emotional tools such as toy animals which were used as metaphors and a source of inspiration and recognition to identify the user's own work. This was an individual exercise where the users listed some keywords characterizing their own work processes and work style.

D. Description of current and future collective processes

The users were given the following description of an activity: 'Let the dreams and thoughts flow about how we work together in present and future time'. This was a group activity for 2–4 persons in six different groups. The result was six presentations which varied in form and character, but all of them made sense according to the exercise. The first was a PPT presentation listing identified characteristics. The second was a similar PPT presentation but supplemented with music. The third presentation was a song performed by the whole group, and the fourth was a verbal description complemented with characteristics listed on a flip chart. The latter performances showed an occurrence as it would appear in the present situation in present time compared with the same in the 'ideal' future.

E. Introductory lecture

The activity was a PPT presentation held by one of the researchers as an inspiration source, introducing the relationship between users and their physical surroundings, work patterns, and architecture. The content of the introductory lecture was a cocktail of topics related to new knowledge workplaces, with examples from earlier research as 'best practices'.

F. Characteristics of individual workplaces

The exercise was to select two picture cards as inspiration tools expressing the important characteristics of the user's own workplace. The cards were images of landscapes, people, and buildings, expressing elements such as form, materials and colours, mood and atmosphere, contemplated spaces, and different kinds of metaphors. This was an individual activity lasting for 5–10 minutes as a part one of a two-phase activity.

G. Characteristics of the collective workplace

Part two of the two-phase activity, Objective 2, was a group activity in which the participants brought their two selected images from the first part. The users were divided into four mixed groups, with 6–7 participants in each group. Each participant had two minutes to explain their choice of cards to the other members of the group. Then the group had 1–15 minutes to discuss, negotiate, and decide which two of all of the selected images best expressed the collective demand for the workplace. The last part of this activity was to present the choice to their colleagues in the other groups.

H. 'The impact of the building' for the company

Four questions were posed about objectives concerning OpCentre's identity and profile, both internally and externally. In a cadre setting, answers to each of the questions were written down on a big poster (four posters in total). This was a group activity organized with four groups in rotation, with each group given 15 minutes on each poster to discuss and respond to the objectives by writing down keywords regarding the question. The next group continued the discussion regarding to the particular question, adding more keywords, and so forth.

After the briefing seminar

After activity H. the one-day introductory workshop was closed. During the course of day we had given the participants a competition activity concerning a slogan for the briefing process. The leaders acted as a panel of judges. The selected slogan was: 'On rails against new landscape'. During the next few weeks a continuation of activity H., called I., was completed by randomly selected members of staff in all four of the organization's divisions.

I. 'The impact of the building' for the divisions

The activity was a complementing group activity to activity H. Each of the divisions at OpCentre sharpened, supplemented, and detailed the objectives related to the operation centre's identity and profile, adapting their own objectives.

The results from all of the activities listed above were presented and discussed with respect to all users in a meeting in mid-January 2008. The users were given two further individual activities, J. and L., and the division leaders were given the matrix M., and all activities were to be completed within one week.

J. Photograph of the existing interior

The first part of the activity was an individual exercise involving taking photos of the interior of the existing office with a mobile phone camera, and supplementing the photos with short text or keywords. The task was to take six photographs according the participant's own subjective sense of what were the best places for activities such as dialogues with colleagues, both professional and social, for teamwork, and for working alone, for amusement, and the best place to be, all with some keywords describing the reasons for the choice of the place.

K. Posters with collected photographs

Figure 2: The activities. From left to right: C. – Description of current individual work processes; F. and G. – Characteristics of individual and collective workplace, respectively; H. – 'The impact of the building' for the company; and K. – Posters with collected photographs.

The six photographs with keywords generated by activity J. were collected and sorted by the researchers. Six posters were made, all with a similar layout and displaying a collection of photographs and keywords regarding the same task. The posters were put up on the wall in a crowded area in the operation centre, close to the coffee machine and kitchen. The content of the activity was intended to be a source of inspiration to the users, for them to consider and reflect upon, and to share and discuss similarities and differences between their colleagues' subjective choices of best places, and also to these compare with their own choices.

L. Work utilization survey

A matrix was developed for the purpose of recording the amount of time used during one work week. The users recorded the time spent working alone or interactively, such as when working in a team or attending meetings. This time study was intended to give an indication of the work pattern of the individual user as well as the users as a community.

M. Matrix relations and neighbourhood

This activity was carried out by the head of the divisions, recording the prospective types of work in the office, such as problem solving, work involving heavy or light concentration and the need for tranquillity, formal and informal meetings, social activities, and activities in other locations. In addition, the quantity of these types of work activities was related to different types of users and roles.

The four activities listed were presented and discussed in a new meeting with all users three weeks later. After that, a focus group with representatives of the users was established.

N. Workshops with focus group

Seven workshops were held with a focus group, consisting of seven users: representatives from all divisions, and one researcher. The main activity was to carry out, formulate, and specify the demand as the foundation for the brief. The requirements for each function and type of room or space needed were discussed and negotiated, decided, repeated, and specified during meetings in an iterative way. To support this process of synthesizing the demand, the data collected and results from discussions and negotiations within the group were developed from one meeting to the next. The result became a first version of the detailed functional brief, which was a document in PowerPoint format. Each function, required equipment, and

type of room, space and zone was briefly described according to its content and purpose. Requirements and qualities such as type and amount of furniture were listed, and illustrated with images of the interior and elements needed. This version was the first brief presented and handed over to the architect before the concept design was started.

In the meantime, between the workshops, single members of the focus group were given exercises with regard to detailing the demand. Additionally, an excursion was arranged for the focus group after the first workshop. We visited an office building with similar layout in terms of an open plan solution and were given a guided tour by the facility manager.

O. Group interviews

An interview guide developed by the researchers was used in two semi-structured group interviews with the users at the division called the Network Supervision Centre (Nettovervåkning) to collect data on the specific requirements for the core of the operation centre for network supervision. The questions focussed on topics such as work processes and work styles, which for this particular division are done 24 hours per day, 7 days per week. To a high degree the interviews focused on interactions and relations between colleagues, both internally within their own division and concerning all colleagues.

The interview guide was used in the same manner on two subsequent occasions with two mixed groups, composed of users from the divisions respectively called the Support Centre and the Operations and Maintenance Centre.

P. Workshops with user group concerning Network Supervision Centre

These workshops were carried out to specify the demand for the Network Supervision Centre. The activity started with an excursion. Users from the network supervision centre and the focus group visited three similar operation centres in a big Norwegian oil company. A few internal workshops were held, in which three of the users took part. Experiences from the excursion were compared with the Network Supervision Centre's own demands. Sketches were drawn showing the required relations between the supervision workstations and support rooms or space and subsidiary functions, in addition to estimated need for space. The sketches were presented and discussed in workshops which included the architect, and were developed further and included new considerations. One of the researchers participated in two of the workshops.

Q. Delivery to the architect

The delivery of the functional brief to the architect became a process consisting of several activities. The architect produced sketches and drawings showing alternative solutions. The users found that the first sketches did not match their needs and further clarification and illustration of the demand was called for. Hence, dialogues between the architect and the users were needed, to impact on the interpretation, translation, and transformation. A few meetings were held to complement the brief. Between the meetings, sketches were drawn by the users and the architect to gain an intelligible and common understanding of the request. New documents complementing the functional brief were prepared: a summary of the estimated space (in m^2) of the required rooms and space as a traditional brief. The functional brief was then upgraded and developed as a final brief for the design.

DISCUSSION AND CONCLUSIONS

In theory, briefing is described as a process to define objectives and needs to develop an organization, and at the same time provide the necessary data to develop a design that will meet those needs. The aim of the leadership at OpCentre was twofold: 1) to develop a brief for a new office solution that supported knowledge sharing and team work; 2) to solve organizational issues such as the company's profile and cultural aspects due to stability and recruitment. Our aim as researchers was to support the briefing process in order to avoid expensive mistakes and contribute in the translation process from demand to design.

The development of the concept of boundary objects was influenced by the understanding that invisible work and tacit knowledge for a whole group could be vague and at the same time useful. The concept was initially 'motivated by a desire to analyze the nature of cooperative work in absence of consensus' (Star 2010, p. 604). In the briefing process of OpCentre we wanted to use the concept to capture tacit knowledge about work processes among the individuals and user groups and give equal status to the qualitative and quantitative data information as useful in defining the brief. Different forms of arrangements or activities were tested on the user groups. These are listed in Figure 3, in which each of the arrangements or activities is categorized as one of the following forms according to the work of Star and Griesemer (1989): Repositories, Standardized forms, Ideal types, and Coincident boundaries. For each boundary object we have indicated a purpose in order to identify the form of boundary object and the expected outcome.

Figure 3: The BOs used in the briefing process categorized according to four different forms of boundary objects as described by Star and Griesemer (1989).

Repositories	Standardized forms	Ideal types	Coincident boundaries
Background materials Identification of required background information in order to start the briefing process	**Pre-occupancy evaluation** 1. To collect data in order to establish a base line for post-occupancy evaluation 2. To start developing users' awareness	**Matrix relations and neighbour-hood** To gain an overview of the teams (number of people) and their different types of work	**Description of current individual work processes** To encourage individual user's reflections on their own work processes and work types
			Description of current and future collective work processes To encourage users' reflections on their present and future teamwork, interactions, and collaborations
			Introduction lecture To inspire users to start the briefing process, and to encourage reflections on how offices could support their work
			'Characteristics of individual workplace' To identify individual user's experiences and anticipated qualities of the future workplace
			'Characteristics of collective workplace' To identify collective users' experiences and engage the whole department in discussions about the anticipated qualities of the future workplace
	Work utilization survey To collect facts about the time, use of space, and activities at work	**Workshops with user group at the Network Supervision Centre** To identify more detailed information on needs and requirements	**'The impact of the building' for the company** To identify the possible contribution from the physical surroundings in supporting the company's objectives
			'The impact of the building' for the division To identify the possible contribution from the physical surroundings, supporting the company's objectives, and with focus on the department's objectives
			Photographs of the existing interior To capture individual user's experiences of the existing workplace, and also to identify characteristics to be preserved and designed into the new setting
			Poster with collected photographs To increase awareness and comprehension of good qualities in the existing surroundings, and to influence requirements for the new office
		Matrix relations and neighbour-hood To gain an overview of the amount of space required and the different work types	**Workshops with focus group** To collect all information, discuss it and develop the final documents (the brief)
			Group interviews To collect more detailed information about the need of one special group of users the Service Desk (operating continuously and during a crisis)
			Workshops with user group at the Network Supervision Centre To identify detailed information of needs and requirements
			Delivery to the architect To deliver the information, as rich as possible, to the architect as a foundation for the design process, with the goal of making it easy to implement

The users became more aware of their own situation, the goals, and needs. They developed a common understanding of the organization and became engaged on a higher level than in most briefing processes. The activities and iterations became shared representations with interpretive flexibility, and enabled the users to uncover and identify invisible knowledge about work processes that were embedded. Hence, these shared objects appeared as boundary

objects which facilitated the participatory process, the users' discussions and negotiations, and enabled agreements between the users, between the researchers and users, and between the architect and users. This enabled the users to have an equal position in negotiations and to take a leading role in stating the needs and in impacting, adjusting, and coping in the design and construction process. Some examples of the users' engagement, understanding and involvement are listed:

- Some of the key users drew their own sketches to communicate to the architect their own understanding of what they needed from their workspace, defining special elements and organization of work desks.

- The users showed strong involvement in the detailed planning of the workplace solution by quickly agreeing on a universal size for one type of table. This was rather small, but was possible to expand. Even users who had recently had 'earned' a bigger and better work desk accepted the work table in the standard size as agreed.

- The users showed strong involvement in the planning of the intermediate phase of the two-month construction period. They had set aside time to plan the temporary workplace solution. They stayed in an open landscape area which was vacant due to the relocation of a former tenant. The users involved themselves both in planning and the actual physical move, and during one weekend worked voluntarily to relocate themselves to the temporary location. We observed enhanced cohesion as they all collaborated, partly across functional and organizational borders in their temporary workspace. Even users who had previously disliked the idea of an open plan office, made the most out of the existing workstations spread tightly in a single, open space.

The above are examples of a process where there is a strong indication that the use of boundary objects in participatory process may raise end-users' awareness, enabling them to express their experiences and needs to a greater extent. On the other hand, the user participation in the process was extensive, and there is a need for further work to identify the most effective boundary objects, producing the best results with more limited use of time and resources. There is also a need for further investigation of the OpCentre case, evaluating the effect of the workplace in use. The planned post-occupancy evaluation will be the final test to see whether the objectives have been met.

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DISSATISFACTION FACTORS IN THE INFRASTRUCTURE PROJECTS-PROJECT FEEDBACK APPROACH

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Soft measurement tools, such as customer satisfaction and cooperation between parties have been received a lot of interested in construction industry in the recent years. The focus of the studies has been mainly in a customer-general contractor relationship. However, in a project environment it is essential to that project feedback should cover the most important parties in construction supply chain. The purpose of the paper is examining infrastructure project performance through different parties: customer, project consultant, designer, and general contractor. The research is done by analyzing results of a web-based mutual project feedback system (ProPal), where the parties of the project evaluate each other's performance. The main finding is that designers´ performance was evaluated at the lower level than others. Generally, the highest ratings in this survey concerned co-operation between parties and low satisfaction could be found for the items related to project management. The low performance of the designer might be a consequence of that designer have to deal more entireties and the final end product, in contrast to contractors and project consultants. On the whole, this paper suggests that sophisticated feedback system and increased project communication can develop the infrastructure projects for the better performance.

KEYWORDS: Customer satisfaction, key performance indicator, project management, infrastructure project, performance measurement

INTRODUCTION

Infrastructure projects are complicated and every project is unique. Main parties of the projects change with each passing project, which means that new interrelationships are created all the time. Short-term interdependencies do not support satisfaction and confidence between the project parties. In many cases, this has impaired the project delivery. This paper focuses on the dissatisfaction factors of the infrastructure project parties. Especially, the research approach is customer centered. Other project parties concerned in this paper are the

project consultant, designer, and main contractor. The selection of these parties for the paper is justifiable because the main part of interaction and dissatisfaction in the project occur between those parties. The main parties also represent the main tasks: construction management, construction, and design.

The importance of customer satisfaction and orientation has grown due to tightened competition and more demand as a response to the industry's poor performance. In construction, the actors have adopted new practices in striving towards tighter cooperation with customers. Indeed, the entire field of construction is becoming a service business, which emphasizes the cooperation between parties during construction work.

The literature of the soft measurements as an indicator of project success has been focused merely on the relationship between the customer and main contractor. However, also the project participants' satisfaction towards the project has been found to be an important aspect as regards project success. There is also lack of proper information about how different parties in construction assess their mutual performance. This information can be used as a tool for developing construction processes and mutual learning.

It is important to take into account that, depending on the parties' role in the construction process, they might have a different role in the construction project. In other words, it is a question of levels of customership; on which levels in the organization a measurement has been made. For example, it is definitely possible that the project consultant as a client's representative measures the success of the project differently to the client's project manager. Schellhase et al. (1999) emphasize that if several people are involved in the decision process, it is not sensible to limit the survey to one person in the company when collecting data on customer satisfaction. Indeed, if possible, the satisfaction of all members of the client's project team should be surveyed. It is also noted that in this context, the customer is a professional builder and can be defined as the owner of the construction project.

Initially, this paper presents an overview of the dissatisfaction factors in the infrastructure projects as assessed by the main parties in the construction project. This is done by analysing the results of the web-based project feedback system (ProPal), which have been recently developed in Finland. Through versatile feedback information, the various parties can observe the essential needs for development and target the necessary actions. First, a brief literature review is conducted to review approaches to the topic. Subsequently, the study and the results of the data analysis are presented. Finally, some conclusions are discussed.

LITERATURE REVIEW

The importance of satisfied customers and smooth cooperation between parties has been recognized as one of the main challenges in the construction industry. The construction industry has been widely accused of poor performance and unsatisfied customers (Latham 1994; Egan 1998). However, since Latham's and Egan's reports, soft measurement tools such as customer satisfaction have been introduced little by little in the measurements of project success (Chan and Chan 2004; CCI 2004).

Manninen (2009) has shown in his studies that information flows between infrastructure projects parties are at an unsatisfying level. For instance, he argues that the designing stage dialogue between the customer and designer can be poor, which leads to misunderstandings

and the discontent in the relationships. The basic problem in the designing process is that customer cannot deliver their requirements and demands to the designers. According to Manninen's studies, utilization of the building information modeling (BIM) in the infrastructure sector can improve project parties cooperation. As such, the cooperation improvement is based on progressive project briefing and visualization of plans.

In construction business, the customer is acting in a complex environment. Participants who take part in the construction project may have dissimilar goals, values, ways of actions and thinking. These factors and their divergences increase the complexity of construction environment. Pennanen (2004) argues that the complexity of the environment can be decreased through customers' communication with production parties, including design parties. In addition, Pennanen presents that the customers' commitment to production requirements has an important role in managing and decreasing the complexity of construction environment. Consequently, with reference to Pennanen's studies, the complexity of the construction environment can be one principal factor behind the dissatisfaction factors discussed in this paper.

In construction, performance measurement systems have been adopted widely since Latham's and Egan's reports, which criticized construction industry for its bad efficiency, poor performance and low level of customer satisfaction. Investigation of Bassioni et al. (2004) emphasize that because of the special characteristics of the construction industry (uniqueness, one-off products) the focus of performance measurement of the project is on more levels, not just the organizational level. Yu et al. (2007) state that it is important to develop an integrated method to concurrently measure both project performance and company performance. In addition, performance measurement systems have no use if not used as guidance to management decisions.

Key performance indicators (KPIs) constitute a widely used performance measurement framework in the construction. Formerly, KPIs were included in the traditional, "hard" project performance measurements, such as cost, schedule, and technical quality. Later on, the KPI framework has been widened, to take into account soft measurements, such as customer satisfaction. For example, Ward et al. (1991) argued that other factors, such as the quality of relationships among participants and flexibility can influence customer satisfaction and thus affect the success/failure of the project. They provide a useful framework for measuring and comparing project performance for future studies. They also furnish project managers, clients and other project parties with useful information to implement a project successfully (Chan & Chan, 2004).

Chua et al. (1999) have investigated critical success factors (CSF) for different project objectives. Their hierarchical model shows that project characteristics and contractual arrangements cannot be left out of the success equation. In other words, project success is not determined exclusively by the PM, monitoring, and control efforts. Chan et al. (2004) have developed a conceptual framework on critical success factors. Their study, which was based on large literature review, found major groups of independent variables which are identified as crucial to project success: project-related factors, project procedures, project management actions, human related factors, and external environment. Soetanto et al. (1992) have also examined critical success factors. They found four factors which are critical for success projects: (1) A well-organized, cohesive facility team to manage, plan, design, construct, and operate the facility. (2) A series of contracts that allows and encourages the various specialists to behave as a team without conflicts of interest and differing goals. (3)

Experience in the management, planning, design, construction, and operations of similar facilities. (4) Timely, valuable optimization information from the owner, user, designer, contractor, and operator in the planning and design phases of the facility.

In a project environment, it is essential that project feedback cover the most important parties in the supply chain and is bidirectional (Kärnä, 2009). There are several reasons for that kind of thinking. First, the complex nature of the construction process, changes in project organization, the uniqueness of each project, and the project parties' different objectives make it difficult to make use of past experiences and customer feedback in future projects. These fundamental characteristics of construction projects also complicate the evaluation of the project outcome and emphasize the need for developing an effective and efficient evaluation system (Kumaraswamy and Thorpe, 1996). Secondly, project organization usually involves complex goals. Each project member (owners, architects and engineers, construction management consultants, main contractors and subcontractors) look at the project from their own perspectives and also have their own criteria for measuring success. In order to attain the project goals, a systematic evaluation of the organizations' performance is required to provide feedback for guiding the participants' behavior (Liu and Walker, 1998). Thirdly, traditional project success measurements, expressed in terms of time, cost and quality no longer meet the needs of today. Thus, the end user's satisfaction, customer satisfaction and the participants satisfaction has been used as important measures of project success (Chan and Chan, 2004; Cheung et al. 2000). Finally, each company in the construction supply chain is both a customer and a supplier, and the value created by them is a fundamental factor in the project's success (e.g. Love et al. 2000). Because the performance of each participant in the construction project coalition is interdependent, other participants should assess their performance. In other words, when evaluating the co-operation between parties in the construction supply chain, it is essential to exploit mutual feedback. It is also well known that the poor performance of one party will affect the performance of the next party (Kanji and Wong, 1998).

Project communication has an important role in project success to deliver results in time and at reasonable costs. Anders et al. (2006) argue that main contributors for sound project impacts are strong project commitment and rich project communications. According to their research results, project managers should put an effort to communication within the project and its environment. Also e.g. Pocock et al. (1996) have examined the relationship between project interaction and performance indicators. They found that the projects with a low degree of interaction have expansive cost and schedule growth and include a number of modifications, while projects with the high degree of interaction tend to have better and more consistent performance indicators.

Thus, it is obvious that the project feedback system will develop project communications and increase understanding between project parties. In parallel with the research results of Kärnä (2009) and Anders et al. (2006), the feedback system has a connection to project delivery in time and at reasonable costs. According to Flyvberg et al. (2003), cost overruns exist almost in 90 per cent of infrastructure projects. As such, the project cost estimation and cost overruns are a significant problem in infrastructure sector which needs to be solved somehow.

THE STUDY

ProPal-project feedback system

Data for this study were gathered using ProPal, a project feedback system which was recently developed in Finland to improve customer orientation and quality in the construction industry. ProPal project feedback system is a technically developed and versatile system serving the whole industry and it is operated by Finnish Construction Quality Association (RALA). RALA is a joint association representing clients, contractors, and consultants in Finland. Its aim is to improve the prerequisites of construction quality.

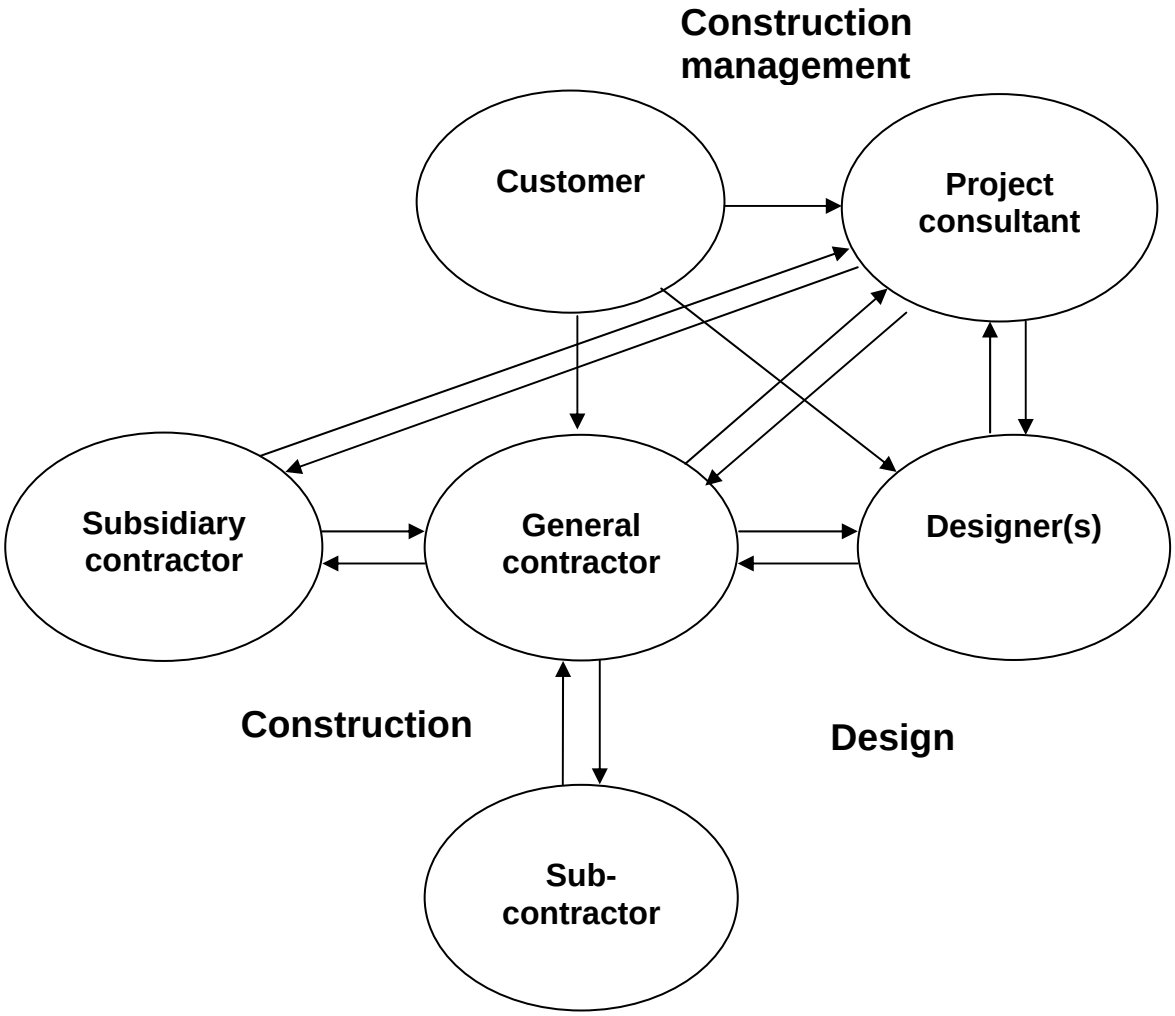
Companies need versatile information yielded by the feedback system in order to be able to utilize the feedback given in enhancing their own operations. The system has a Web-based interface that facilitates use. The feedback system offers clear, real time reports which can be targeted at the company's products and processes. By comparing various background variables, the company can compare its own performance with similar ones in the market. Therefore, the project feedback system is a cost-effective tool for the company's internal and external benchmark. Further, the system adapts to the needs of different companies since the structure and processes of business in the industry are very heterogenic, so it can be utilized in, e.g., various forms of procurement methods.

With the help of the feedback system, the various parties can observe the essential needs for development and target the necessary actions. The objective of using the system is that through openness and mutual learning, cooperation between parties will develop and the customer orientation of the entire industry is improved.

Using the customer feedback system, the owner would establish goals in terms of performance quality. By monitoring the project team's progress in reaching these goals, team members can re-evaluate the quality of the processes necessary to reach them. A multifaceted feedback system also denotes the areas needing improvement in the whole branch of industry and gives opportunities for setting the benchmarks of customer satisfaction. In addition, a standard feedback system may be considered more objective than a contractor's own feedback survey because social interaction components do not exist in the standard system. Thus, the project feedback system enables using 15 different questionnaires in which various actors assess each other's operations.

Figure 1 illustrates the feedback flows between the parties in the system. Each arrow represents the direction of the feedback and one questionnaire. All feedback flows between parties were bidirectional except for the customer as his/her operations are not assessed here.

Figure 1. Feedback flows in the ProPal-feedback system.



The ProPal feedback system and its use in the construction process consist of three processes:

1. Agreeing on the feedback rules where the central parties agree on the rules for the feedback use and determine the level of openness of the project's feedback reports. This may take place, for instance, during the first site meeting.

2. Drawing up a feedback plan in which project information and participants are entered and the feedback rounds are determined and started. In the initial stages of a project, all participants are not necessarily known, so it is important that the feedback plan can be complemented and multiple feedback rounds can be started within one project.

3. Reporting the project feedback where the feedback is reported to the project parties in the level of openness agreed upon. Static feedback stands for standard, immediate feedback for the various parties of the project. In the system, the users can also form dynamic reports based on the feedback database. Using dynamic reports, companies can perform various comparisons with the feedback given and received. The feedback is saved in a feedback database in which company level feedback with various categorizations can be produced. Figure 1 depicts the operational operations model of the feedback system.

Research design and results

The objective of the study was to examine dissatisfaction in the infrastructure assessed by major parties in the construction. The study exploits data which has been obtained from the Finnish ProPal project feedback system shortly introduced in the last chapter. The study and its data cover feedbacks of Finnish infrastructure projects only.

In the feedback system, the questions are formed as statements and connected to a scale on which answer (1) describes the operations very inaccurately and, correspondingly, (5) very accurately. No opinion (N/A) could also be chosen as an answer. In the open comment field, the feedback giver can specify their answers. The questionnaire is answered electronically using an Internet form which displays the project and company being evaluated.

The basis for the contents of the questions was formed by the various tasks in construction and the requirements they set for a construction project. The feedback questions concentrate on the matters each party considers important, and, on the other hand, those which each party can assess. The tasks and requirements of various parties in construction were grouped into categories which are similar with each other although the contents of the questions are determined by the role and task of the actor. The evaluation areas common to all parties were these:

- Project management
- Cooperation
- Staff
- Accomplishing goals

Totally nine main feedback flows were chosen to best suit the purpose of this study (Figure 2). These feedback flows covers the main tasks in the construction: construction management, construction and design and also the feedback of the main parties: customer, project consultant, main contractor and design team (see Table 1).

Table 1 depicts the feedback flows and percentual distribution of the dissatisfaction factors. In the table, columns illustrate different categories in the surveys and distribution of the separate feedback flows are in the rows. The percentage (%) shows the percentual distribution of evaluations which have been graded with 1 (completely dissatisfied) and 2 (dissatisfied), which constitutes also the dissatisfaction criteria of the study. In the light of the focus of the study, for example, sub-contractors´ feedback was not examined here.

Table 1. Feedback flows and percentual distribution of the dissatisfaction factors.

Feedback giver	Feedback recipient	Project mgt	Co-operation	Staff	Accomplishing goals	Total
Customer	→ Project consultant	4,32 %	4,29 %	5,34 %	6,08 %	5,02 %
	→ Main contractor	3,40 %	4,85 %	-	4,90 %	4,44 %
	→ Designer	1,44 %	2,37 %	0 %	0,00 %	1,15 %
Project consultant	→ Main contractor	5,68 %	4,14 %	3,26 %	4,20 %	4,49 %
	→ Designer	13,41 %	13,07 %	16,04 %	15,57 %	14,10 %
Main contractor	→ Project consultant	6,45 %	3,41 %	2,61 %	-	4,99 %
	→ Designer	11,40 %	2,54 %	9,11 %	11,22 %	8,80 %
Designer	→ Project consultant	6,93 %	8,36 %	-	-	7,47 %
	→ Main contractor	4,38 %	4,40 %	3,94 %	-	4,28 %

The highest ratings in this survey concerned the co-operation between parties and low satisfaction was found in the items related to project management. However, there are a lot of variations in each category.

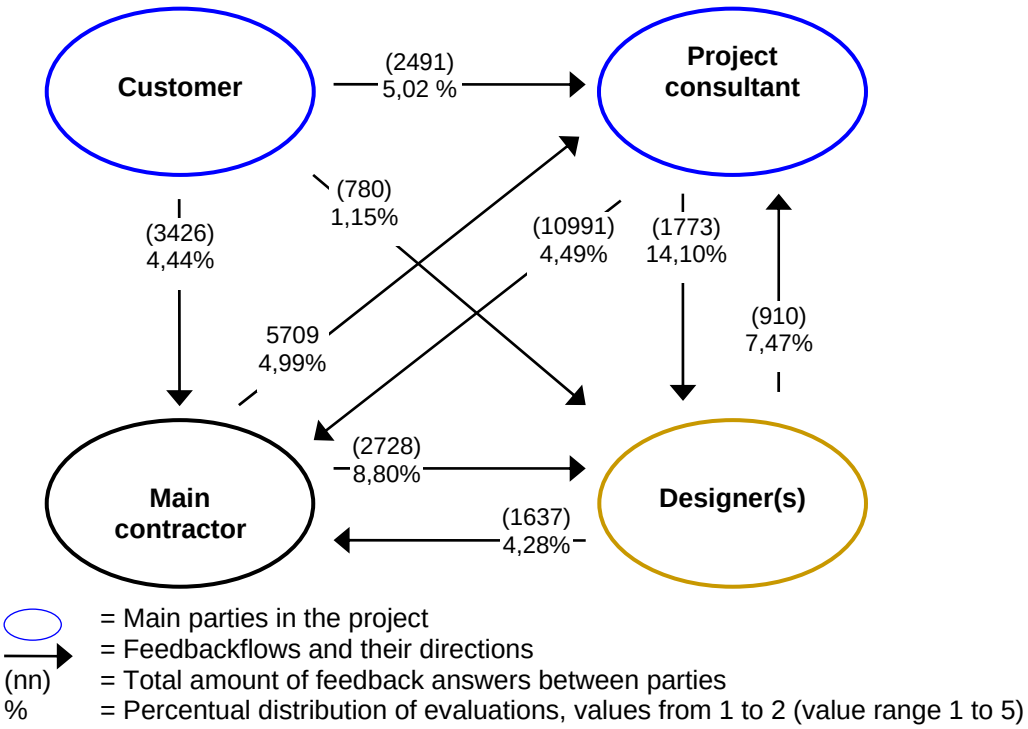
In general, according to Table 1, relations between the parties related to design seem to have more dissatisfaction items than the other relations. Exceptionally, in the feedback flows, where the customer gives feedback to others - in this feedback flow, the designers' performance was assessed the best in the data. Firstly, this might be due to customers' distance to the project management and construction phase. Secondly, we assume that customers have had a strong impact on plans.

When examining the project consultant's feedback of the designer's performance, it is remarkable that approximately 14% feedbacks are at poor level. The result is totally above the average level of all the feedbacks. Poor performance can be noticed especially in factors related to the adherence to schedule, accuracy, and compatibility of the design plans. There is a same kind of phenomenon in the main contractors' evaluation of designers' performance where adherence to schedule is emphasized, but also main contractors assess that designers do not have adequate resources in the project.

Designers' feedback to project consultant has had rather high levels of dissatisfaction. Dissatisfaction factors in this relationship are related mainly to project consultants' ability to set targets and management of schedules. On the other hand, these factors reflect project consultants' evaluation of the designers' performance.

Figure 2 depicts the main results of the research. In Figure 2, the percentage (%) shows the percentual distribution of evaluations which have been graded with 1 (completely dissatisfied) and 2 (dissatisfied). Each arrow represents the direction of the feedback. Basically, this number depicts the level of dissatisfaction directed by the arrow.

Figure 2. Dissatisfaction factors.



CONCLUSIONS

This section discusses the conclusions of the research and is dedicated to suggestions for improving the feedback system. In general, a common feedback system produces valuable information to all main parties in the construction project. Construction industry is widely accused for its poor performance and adversities in relationships, and it has been referred to as a branch which never learns from its mistakes. The objective of gathering mutual feedback is to learn from past experiences and to transfer this information to knowledge in the future projects. Its purpose is also to enhance communication and cooperation between parties. By identifying dissatisfaction factors, different parties can develop their process, which benefits the whole project and indirectly the projects' intended users.

Interestingly, according to the data analysis, the designer's performance has been evaluated to be on a poorer level than the other parties' performance. This might occur due to the fact that designers have to deal with more entities and the final end product, in contrast to contractors and project consultants who have to think and work with more details and day-to-day problems on site. Typically, contractors have some unexpected or current problems for which they need information. In this case, the design process does not serve the construction production in the best way and the designers' current ability of problem solving and quick response is weak. Designers' thinking focuses largely on the whole structure and functioning of the project as a whole, in individual problem-solving will be forced into the background.

On the other hand, it is also natural that designers cannot perceive all the problems beforehand. Therefore, it is also hard to take these problems into account in their project management and effectively prepare for them. This might require certain "slackness" in the

design schedules and resources from the beginning. This could be simplified as follows: where designers view the project as beyond to the future, contractors view the project as the way things are going, right here right now.

The feedback system evaluates the project parties' level of accomplishing predetermined goals. The goals are related to finances, schedules, quality, environment, product utilization, and cooperation of parties. As such, the feedback system does not evaluate how construction processes and products meet end users' needs, requirements, and wishes. Therefore, the feedback system needs to be expanded using the end user parties' feedbacks. End user feedback collection has two challenges. Firstly, how the feedback systems can present matters which should be evaluated by the end users. Building information modeling (BIM) and the applications related to it can be a solution to this first challenge. Applications such as virtual models and simulations can represent the matters for the end users in a popular way. The popular representation has a significant role because the end users' understanding of the matters will be a basis for the feedback collection. Without the understanding there is no reason for collecting end user feedbacks. The second challenge is to consider the kind of feedback collected from end user. The goals mentioned above are not eligible for end user feedback evaluation because feedback must be connected to the end users practical experiences. Consequently, the end user feedback system requires great attention and a lot of development before complete utilization.

On the whole, a sophisticated feedback system and increased project communication can assist in developing the cost management and control of the infrastructure projects for the better performance. The feedback system has a positive influence on the project delivery as regards costs and time because it increases the communication of the project. This study is also part of the ProPal evaluation program wherein the feedback system is examined regularly in order to improve its features to better serve the Finnish and international construction industry; and it is not without limitations – e.g. more statistical analysis is needed to capture above mentioned phenomenon.

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USE*FRAME* – A FRAMEWORK TO UNDERSTAND AND MAP USABILITY RESEARCH

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Research concerning usability of facilities has its starting point in a need to understand the interaction between facilities and use and the characteristics of this interaction. Simply put; how buildings support the activities carried out in them by the users. This issue is also relevant to the construction sector as a whole as the focus on quality, value, end-users requirements and client needs is increasing. As "use" is a general term encompassing several aspects and perspectives there is a need for a framework to map and describe what has been in focus in different studies in order to define and relate different research approaches to each other. If use is discussed in relationship to ongoing organizational development or in relationship to a specific ongoing construction project the contexts are different. The framework presented can be a useful tool for communicating research within the area of usability of facilities and as such an input in further development of the field of usability and understanding of users needs in the built environment.

KEYWORDS: Facilities Management, usability research, end-users, construction clients

INTRODUCTION

Starting point

This paper reports on a development of a framework emerging out of a research project focussing usability. In the REBUS project, User-oriented Benchmarking for Usability and Sustainable Performance of Real Estate, a need for a framework to map, describe, understand and discuss aspects of usability was identified. A framework that also could illustrate what had been in focus in different studies as well as a possibility to relate different research approaches to each other (Blakstad, Lindahl & Nenonen 2010). In the research project discussions led to a development of a framework that enable positioning of research related to studies of usability of facilities. If *use* is discussed in relationship to ongoing organizational development or in relationship to a specific ongoing construction project, the contexts are different. The framework presented in this paper is an input to further development of

research in the field of facilities management, usability and management of client requirements. It can also serve as a useful tool for focusing and communicating research within the area of usability and contribute to a structured FM-discourse on processes, organizational development, usability of places and construction projects.

The REBUS-project

The field of construction and real estate has often been accused of not utilizing the experiences of former construction projects and repeating the same mistakes and irregularities in recurring projects (Egan 1998; Granath & Hinnerson 2002; Kamara, Amumba & Evbuomwan, 2002). The stakeholders and users in the field of construction and real estate need versatile and systematic feedback data about the usability and functionality of the buildings they use. There is also a need for methods concerning project management of the design process and methods to capture the characteristics and aspects that support usability. If construction industry professionals can better understand the requirements of the users and translate them into the design and construction processes the results should be more efficient facilities. It is, however, not only about new methods and better processes, it is also about the actors in the processes and what governs their actions. Improvement depends on how professionals benchmark and how they manage usability related issues. The REBUS project addressed two issues where end-user orientation has a major role. (Blakstad, Lindahl & Nenonen 2010) These were:

- How to achieve usability by the support of the project management processes in construction, *The project and facilities management approach*
- How to achieve usability through benchmarking of usability and of buildings in use, *The benchmarking approach*

The first issue is connected to defining and setting the criteria and values guiding the construction process from the end-user perspective, this concerns the processes to capture information about usability as well as to develop processes that transform this information to knowledge between different stakeholders. The first issue also includes management in order to achieve a relevant product and facility. The second issue concerns the information and data gathered to be used in benchmarking buildings' usability and functionality from the user perspective. This approach is also strived for, albeit with focus primarily on the building, in the CREDIT project focussing benchmarking (Karud, et.al. 2010).

RESEARCH APPROACH AND COMMON GROUND

The REBUS-project took its starting point in a user-orientated approach, or even user-based, that starts in the use of facilities and not in the construction process that deliver the facilities. The facilities in use are created through the interaction between organizational, business and spatial development. Complementing to this approach there are approaches that aim to understand user requirements from a business perspective, a contractors business development need, a strict work environmental perspective, power issues etc. It is important to recognize that different approaches need different sets of theories to be congruent.

The research carried out in the REBUS project was done by a network of researchers from TKK (now Aalto University) in Finland, Faculty of Architecture and Fine Art, NTNU and SINTEF in Norway and Chalmers University of Technology in Sweden. In addition to these there also were participants from DTU in Denmark and Iceland. The research groups included experience from research within the field of Facilities Management, architecture,

real estate, briefing processes and project management in construction. Several of the participants are also active in CIB W 111 a network of academic and industry partners investigating the concept of usability of workplaces. The group was created to apply concepts of usability, commonly used in the fields of IT and engineering, to provide a better understanding of the user experience of buildings and of workplaces. Important tools in the work by W 111, and also in the REBUS project, have been design interventions, walk-throughs and observations, narrative descriptions, structured or semi-structured elaborated interview techniques. In addition there were also work-shops based on case reports and more open workshops intended to develop frameworks of concepts in the early exploratory phase. Significant for these ethnographical methods is that it is basically a qualitative method but can be enhanced by including relevant quantitative data. The methods call for a close interaction between observers and the observed (Nenonen, Junnonen & Kärnä 2008; Workspace project 2001). As pointed out in earlier works, evaluation of usability requires multi-method strategies, and combination of both qualitative and quantitative methods (Blakstad, Hansen & Knudsen 2008). Theory also affirms that context-dependent knowledge from case studies is not less valid than general theoretical (and context-independent) knowledge (Hansen et.al. 2010a, b), a fact that validates the research approach described above.

USABILITY

Buildings are built for a purpose: to support and shelter the human activities. Depending on how well buildings serve their purpose and deliver relevant and appropriate experiences and effects for their users, they impact on the efficiency of the user organization, the satisfaction of the individual end users and the possibility of achievement of goals for the businesses that occupy them. Studies have shown that in order to assess usability one has to focus on the effect of the building on the user organizations fulfilment of goals, as well as the end users satisfaction and experience (Alexander et.al. 2005). Understanding the user needs and being able to use this as guidance is believed to enable more efficient facilities and facilities that through their matching against user needs also are resource effective. Traditional programming or briefing of buildings focuses on the properties of the building itself. (Ryd 2003) They define the functional properties of the building and assume that usability will follow as a causal effect of a functional design. This has caused difficulties when the design and effect have not been working along the intentions that governed the original project. Issues like value-management, process orientation and studies of how to incorporate users in the construction process have been the result. (e.g. Alexander et.al 2010; Emmit & Prins 2005; Karud et.al 2010) The outset for the research presented in this paper is that the key issue is usability of the premises in use.

The first aspect when discussing and studying a building is usually functionality. Functionality can be defined as a property given to an artefact in order to create a practical effect (Warell, 2001). An important effect can be described as usability (ISO 9241-11). In ISO 9241-11 three factors or aspects are described that determine usability. Efficiency means that the artefact allows the users to perform with ease and with little use of resources. Effectiveness describes the ability of the artefact to deliver a certain desired effect. The third factor is satisfaction that describes the users feeling and attitudes to the artefact and its effects, thus connecting experiences to use of facilities. In addition to the above it is important to recognize that the technical and physical properties of the artefact and its theoretical potential to deliver a certain effect do not automatically make it usable in the real

world. As a result of the definition of usability it also depends on the situation in which the artefact is used, the context the artefact is designed and used in and the values of the designers and users. Both context and values change with time and place. Usability may through the connection to time and place also be understood as the relationship between users and buildings (Blakstad 2001; Kernohan et.al. 1992). According to Fenker (2008) this is always socially constructed and is hence related to the users' experiences of the facilities. This means that the usability of a building never only depends on the building as such and that usability must be understood in context.

COORDINATION OF RESEARCH FINDINGS AND EXPERIENCES – A FRAMEWORK APPROACH

The REBUS project concerned knowledge of usability and how this can be benchmarked to be used to improve use and operation as well as development of new buildings. It has addressed the evaluation of usability as such, as well as the process of implementing knowledge of usability in the construction of new projects and in improvement and management of existing buildings. As the researchers had been active in several usability oriented research projects previously there was a broad knowledge in the group. The projects had covered issues from dialogue based processes in conceptual stages to research on how to implement users' requirements in construction projects in as different settings as organizational change projects to actual refurbishment projects. The broad approach and experiences led to a discussion on how the different approaches were related. During the project several models and frameworks were discussed in order to grasp the different approaches in the national studies and to define and relate the different projects to each other. There was also a perceived need to relate what had been done in previous research to establish some state of the art understanding of how the concept of usability and uses were defined and utilized. As a result of discussions in workshops of the REBUS-project a framework was developed based on experience and knowledge in the research team. The framework developed is based on the steps presented below and is called USE*frame*.

Facilities in use

Organizations have facilities that they use to support their activities in order to achieve the goals set for that organization. This use "happens" in the context for that organization, context being societal, social, political, financial etc. A situation in which the relationship between the building and its users is socially constructed (Blakstad 2001; Fenker 2008). The facilities are used on a daily basis and during this use issues arise continuously among staff and maintenance staff concerning the effects of the facilities. These experiences are fed forward to development of knowledge. Important to recognize is that much of these experiences from in use are tacit, or unarticulated (Polanyi 1983).

Development of knowledge

The experience from use form the basis for new or revised knowledge and is collected in several ways, usually through reporting systems, regular health and safety surveys or through facility service organizations. This can be done incrementally and unstructured as well as structured through for example evaluations and questionnaires or other methodologies. However, a lot of experiences from daily use are also not articulated and documented and this step therefore point to the importance of articulating and reflecting on experiences to form new knowledge. (Ellström 2011; Schön 1983)

Some issues that arise from daily use are of simple character and can be fed directly into action; changing the use or changing the facilities. Experiences during the use are often acted upon on daily basis and fed back as new, often unarticulated, knowledge and actions. A typical example is the janitor that over the time of use learns the intricacies of a building.

Some experiences are also never or seldom collected until a process to act requires them, for example a redesign of a facility may require that staff is interviewed, e.g. as a starting point for a refurbishment project. This means that the loop from experience to project is shortened and that, depending how efficient knowledge development is, it may or may not contribute to the process. These processes can also be based on research results from projects like the REBUS project, they can be developed by professionals within the field of FM. It can also be a situation where the people carrying the actual experiences and knowledge are not part of the knowledge creating process, the project. (Lindahl 2008)

Development of knowledge can be augmented and supported by methods like walk-troughs, study visits, participation etc. (Blakstad, Hansen & Knudsen 2008; Granath 1991; Lindahl 2001) or through evaluation approaches such as Post Occupancy Evaluation, POE (Preiser & Visher 2005). But also conceptual briefing methods can be used in this phase (Blyth & Worthington 2010; Ryd 2003).

New knowledge

From the development of knowledge a new set of beliefs and data is formed. The new knowledge that is created can, as noted above, be fed directly back to the daily activities or it can be evaluated and developed and fed forward to e.g. briefs, policies, guidance, or directives. It can also be more difficult to get a hold of when it is carried by actors in the process (Davenport & Prusak 2000). Often experiences and knowledge about facilities in use are carried by for example maintenance staff and users that need participative processes to share that knowledge with stakeholders involved with development and management of facilities. The new knowledge must be articulated, or explicit, to be fed forward, otherwise it may only be carried in the actions of the people concerned. This process has much in common with the SECI-process described by Nonaka and Takeuchi (1995) where knowledge develops through an interactive and iterative process from tacit to explicit. In construction, once it gets to the project, the largest problem is to manage knowledge from project to project and not to lose valuable information and experiences (Anumba, Egbu & Carillo 2005).

Governance

The new knowledge that has been created and fed forward forms the basis for governance and management of actions. Often this concerns knowledge about the importance of the relationship between space and organizational performance (Becker & Steele 1995). This step concerns the development of principles that shall control or guide action. Included in this is for example the building brief as a governing document. (Kamara, Amumba & Evbuomwan, 2002; Ryd 2003) Documents and principles of action govern what can and shall be done. Governance can also be rooted in cultural aspects that govern what actions and standpoints that are appropriate in a specific organizational context and culture.

Action

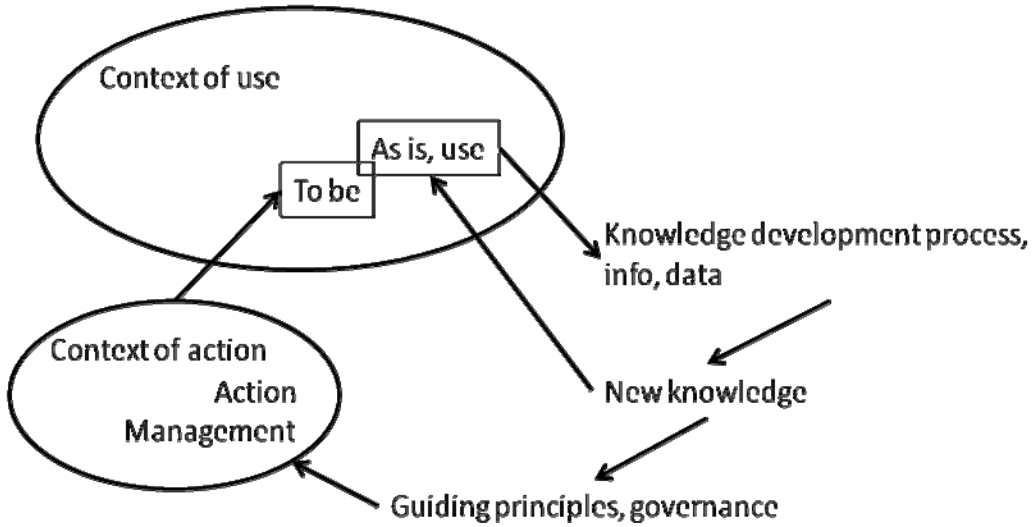
When we know what to do, as documented in briefs, guidelines etc, and when we have guidance on how to do it, via project management policies, and acquired knowledge of with which resources and responsibilities that apply; then we can act. Briefs and guidelines can be regarded as more or less well defined starting points, and as the knowledge of what to do ideally develop through an iterative process between briefing and design this guides action.

The understanding of usability, e.g. by doing usability evaluations will also provide a better point of departure. The action is managed in a context; organizational, cultural, political etc. (Fenker 2008; Lindahl & Granath 2006) The action is directed to support, affect or change the future use of, in the REBUS-project, facilities for organizations.

Facilities to be, to use

Once the experiences have been transformed and fed forward to the project the new or changed facilities will be completed. Figure 1 illustrates the steps described above.

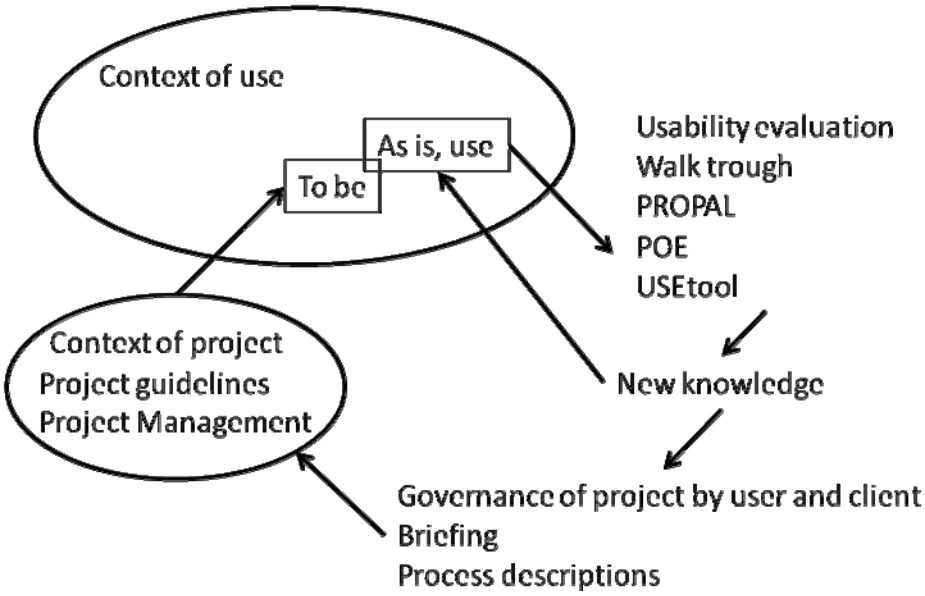
Figure 1. The basic framework.



THE FRAMEWORK USEFRAME AND THE REBUS-PROJECT

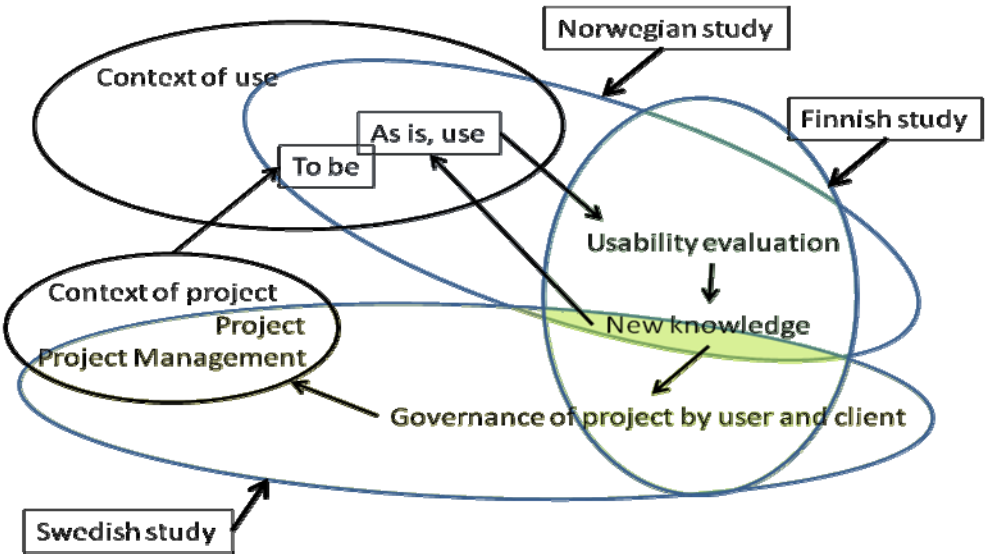
The framework presented above, in Figure 1, was developed in the REBUS-project to map how the different national studies related. If Figure 1 is ”translated” to the REBUS-project the terminology changes slightly. The development of knowledge is then primarily the usability evaluation. This is supported by a set of multiple methods, including interviews, focus groups and walk-troughs as in the Norwegian project. In the same way the Finnish project and its development of PROPAL for feedback (Kärnä et.al. 2009) can be positioned as a survey method covering the steps from evaluation results to feedback/forward eventually governing the project whereas the Swedish project concerned how requirements where documented and managed. This is illustrated in Figure 2, below.

Figure 2. The framework USE*frame* adapted to terminology used in the REBUS research project



The framework can also be used to illustrate the main focus of the three national projects in the REBUS-project. Although the projects that were studied generally touched upon a full loop, from studying actual use to development of use via new knowledge implemented in projects, the main focus from a theoretical and empirical standpoint was much more defined in each national project. The main fields are illustrated in figure 3, below.

Figure 3. The framework USE*frame* adapted to the key areas for the national projects in the REBUS research project



Studying the framework above one must bear in mind that even these ovals encompass a huge set of issues. The Norwegian project had its focus on methods to collect and structure user experiences in relationship to quality of use, but looked also into adjacent research issues to frame the main question. As did the Swedish and Finnish projects, e.g. the Swedish project studied evaluations but in order to develop briefing and project management, not in order to develop the evaluations methods as such. The Finnish study focused on feedback and feed forward flows and on the feedback gathering systems and possible IT-applications.

Comments to the REBUS framework

The loop in the framework presented implies that there is a full circle from use to various inputs in the process of changing or building facilities. However, there is often no complete process unless the user organization has an ongoing process that monitors use of space/workspace in the organization. This is of course due to the fact that most organizations do not build/refurbish on a continuous basis. Often the maintenance organization maps certain aspects and the business organization others. Usually health care and hospitality are the two areas where this is actually done in a more elaborate form. Health care often having facility providers that continuously work to match the needs of the medical and organizational processes, whereas in the hospitality industry, the hotel room or conference venue is challenged by new customers every day. (Hinnerson 2008)

Projects, borders and measuring

As the framework describes a complete loop, it doesn't indicate borders or limitations between the steps. Most projects, and especially construction projects, are defined by a specific goal to be delivered on time and to a certain cost and quality. This usually imposes delimitations on how many steps that can be included in a project. Often there are also different organizations involved with different tasks to fulfil, the consultant group with focus on the design, the contractor with focus on the production and the various user representatives from management/client to user/staff. How the usability issues are being brought from daily use to an effect of the facility requires a thorough approach that for example could include facilitators as suggested by Blyth and Worthington (2010). Thus there is a need for development of knowledge and mechanisms that can support integration between projects and phases of projects as well as between areas like spatial, organizational and business development. This concerns inter-organizational, intra-organizational and cross-disciplinary studies. Dissemination between projects and project phases is a recurring challenge in the "projectified" world of construction; this applies also to the management of user requirements. Through systems and methods like PROPAL and other systems that work with indicators, the user requirements are framed in a method. The limitation of these, even if they drive development based on the assumption that it is good to at least measure what can be measured, is that they measure what can be measured and may miss what is experienced as useful in the daily activities. A multi method strategy therefore is more likely to grasp the complexity of daily use. (Blakstad, Hansen & Knudsen 2008; Olsson, Blakstad & Hansen 2010)

Loops and communication

The connections, the arrows in the framework, can also be viewed as loops. Each of the arrows can for example be reciprocal, guiding principles can be developed by an iterative process between "new knowledge" and "governance".

If we start in the use, context of use, experiences are fed forward in the process via knowledge development to action where is articulated in a project. From a "use point of view" this is where a construction project would be positioned. A Facilities Management, FM, project would, depending on whether it concerns strategic or operational FM, be positioned either in the knowledge development to governance loop or fed directly back to use once data from systems have been assembled to adjust systems managed.

A construction project not based on a long term strategic interaction with the organization concerned, as is the case with most construction projects, would follow along the arrow from action, or project, to use, which in this case would be the delivery of an artefact, building. That does not mean that knowledge developed in the user organization is not disseminated to

the project. The construction project level, however, is different from the knowledge development happening continuously in an organization. There is also a challenge for the user organization to feed forward knowledge to guiding principles that govern the management of the project (Hansen et al 2010).

Another issues arising from the steps, arrows, in the framework is the communication between them. Each step feed forward knowledge in an articulated form. The more professional actors that participates the more special are their specific terminology and language. This point to the need for mechanisms that can manage the translation of knowledge and also the crossing between different projects; the user project, the organizational project and the construction project to name but a few.

Other approaches and relationship to other research

The steps in the framework can be associated to knowledge development models based on reflection and reflective processes (Schön 1983) or general models of actions and feedback like Deming's PDCA (Plan-do-check-act). The framework fits the purpose of a starting point to discuss the REBUS-project and other facility oriented research as well as to position different research approaches in the area of usability, buildings, architecture and construction management. As several research approaches address issues related to users, feedback, benchmarking and customer orientation a framework that can be used to discuss and to position approaches can be useful. This framework aims to contribute to this.

As the framework, to some extent, is generic describing the loop from use via knowledge development to implementation trough governance and management and back to use, different areas of research and theory development can be positioned and related in the framework. It is important, from a clarification point of view, to have the possibility to position and delimit research as the use of the terms; value, user, user-orientation; clients etc are recurring within several research approaches. The traditional construction project is related to the "context of project" rather than to the "usability evaluation and learning from the past" etc. This underlines the importance of congruence and being clear of what client and what user that is in focus.

Summary of comments to the framework

As noted earlier, the researchers in the REBUS-project saw a need of a framework describing a loop from users to completed project where different studies could be positioned. The framework assumes a complete loop, but with defined projects, knowledge transfer processes and professional languages affecting what is addressed and fed forward. The framework presented, USE*frame*, is an input in a discourse on usability and should not be viewed as a framing and definite model. It is an input to further research and development. If the use of the framework should be summarized it can be used to:

- See how different research projects fit together or match each other
- Put bits of previous and current usability research in a "map"
- Support clarity, clarifying what are we talking about and where an issue would "be" located/positioned in the model
- Contribute both to understanding and to feed forward of data/info
- Satisfy user needs by putting/illustrating/explaining their loop in the model
- Satisfy the real estate business by providing a context for methods, it can be communicated and used by professionals

CONCLUSION AND FURTHER DEVELOPMENT

The discussions in the REBUS project led to a development of a framework that enable positioning of research related to studies of usability of facilities and subsequently to a possibility to map where a research project has its focus. The framework is presented in this paper as an input to further development of research in the field of usability. It concerns use of facilities, usability and management of client requirements. It can also be a useful tool for communication of research within the area of usability of facilities and as such also an input to further development. The model aims to be a basis for development of a structured FM-discourse on processes, organizational development, usability of places and construction projects.

Describing and/or understanding the process – further studies

The framework can of course also be used as a basis to discuss the process from "as is" to "to be" and when doing that methods and approaches can be put in a framework context and discussed. The framework does not illustrate an ideal process or *the* process, however, it is believed that it in its basic form actually does grasp all the important steps in a process concerning understanding of the user and user context. A key aspect is that the "knowledge development process" actually also is outside the "context of action", e.g. a project, and thereby allows for understanding of user requirements outside of project constraints. Researchers in the REBUS project aim to further study the relationship between understanding of usability and governance of projects. With a growing interest in integrative support as for example BIM, Building Information Modelling, it is likely that advocates for that approach will argue that these models can do the "trick". On the other hand there are several methods that include participation and workshop approaches; all of these aiming to deliver what the client and user needs. Which approach to choose is likely to be contextual.

Another issue, related to the above, that is important to study further is the short cut, often used in construction, from "as is" to project within "context of project". This enables efficient projects but raises questions of how to get data and client requirements from "the knowledge development process" into the "context of action".

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INFLUENCES OF CONSUMER-CONSTRUCTOR RELATIONSHIPS IN THE GREEN-BUILDING MARKET

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Green building market is rapidly expanding around the globe as the concept of green building and sustainable construction are becoming increasingly recognized by stakeholders in construction industry. In response to consumers' concerns on sustainability issues, the construction industry has to adjust their attitudes and perception towards planning and utilizing of the built environments. Having perceived that interactions and relationships between consumers and constructors play an important role in exerting efforts to promote and attain the prospective achievement of green building market, this paper introduces a conceptualized framework for examining influences of the consumers-constructors relationships (CCR) by using qualitative research methods. It is expected that findings in this study will facilitate conceptualizing improvement of interactive CCR among construction stakeholders so that they can eventually attain mutual benefits from green building markets.

KEYWORDS: Consumer-Constructor Relationships, Green Building Market, Relationship Marketing, Sustainable Business Development

INTRODUCTION

In recent decades, green building has become an integral part of sustainable development strategies in many countries. It is believed that green building can reduce adverse environmental impacts because it uses models of construction, renovation, operation, maintenance and demolition in a more resource-efficient manner and, hence, creates healthier built environments (US Green Building Council, 2010; US EPA, 2010). Despite a growing recognition in benefits of green building in protection of environment, human health, and energy conservation, development of green building markets still faces many challenges due to its high costs of design and construction (Shafii et al., 2006). Furthermore, although the environmental concerns are well studied, the social concerns and business rationale for green building are not yet fully investigated and accepted by stakeholders in construction industry (Chana et al., 2009).

Stakeholders' hesitation in entering the green building market may be reduced by promotion and motivation from the major actor such as the government (Varone & Aebischer, 2000). Nevertheless, promoting green building and transforming main stakeholders such as consumers and constructors into the market require better understanding in conditions that can attract these potential stakeholders. Developers have huge problems in persuading new customers to buy or rent green buildings (Yudelson, 2009). As marketing and consumer information is essential interface between consumers and constructors (Gold & Rubik, 2009), the consumers' choices can influence the constructors in introducing more sustainable construction patterns. This paper's main objective is therefore to conceptualize a framework for investigating the influences of consumer-constructor relationships (CCR) on green

building market (GBM) development. A structural model for CCR influence assessment is developed by integrating sustainability concerns with relationship marketing analysis.

LITERATURE REVIEWS

Defining Sustainable Construction and Green Building

According to Kilbert (2005), the terms 'sustainable' or 'green' construction can be used interchangeably but the term 'sustainable construction' most comprehensively addresses the ecological, social, and economic issues of a building as its principles are to reduce resource consumption, reuse and recycle resources, eliminate toxics, apply life-cycle costing, and focus on quality. Meanwhile, the term 'green building' refers to the characteristics and quality of the structure actually built by implementing sustainable construction's principles and methods. That is, green buildings are designed to be healthy facilities and built in a resource-efficient manner, meaning that consumptions of energy and water are highly efficient, lands are appropriately used, materials used are environmental-friendly, and the life-cycle effects of building's design and operation are minimized.

Green building markets (GBM) and consumer-constructor relationships (CCR)

Construction industry plays an important role in economic and social development. For example, the construction sector is the largest employer in Europe (European Commission, 2010). However, in the environmental perspective, it cannot be denied that the construction industry highly consumes energy and natural resources, emits high volume of greenhouse gases, causes pollutions that damages the environment, generates high amount of solid wastes. The Brundtland report by the World Commission on Environment and Development (WCED, 1987) has significantly raised international attention on the issues of sustainability. In response to this global trend, the green building concept emerged because construction industry has to adapt its business operations with main objectives to retain its competitiveness and possibility of future business expansion (Ortiz et al., 2009). It is notable that changing production and consumption patterns to a more sustainable manner has interrelated objectives. As pointed out by Ofori & Ho (2004), the customers' attitudes and concerns on the environmental impacts may be translated into demand conditions. Such demand then influences corporate behaviors and urges construction firms to supply the market with their commitment to green building practices. Golda and Rubik (2009) suggest that, if the consumer choices are to be influenced, the producers (e.g. constructors) and consumers must be interfaced by marketing and consumer information. In this regards, the created consumers-constructors relationship (CCR) in the green-building marketing activities are essential.

Green building relationship marketing

Green building marketing and communication are both important for consumers' needs analysis before the right green building promotional strategies are responsively adopted and adequately applied. While every business organization needs to continuously carry out relationship marketing to increase sales and profits, Hewson et al. (2003) emphasized that the customer relationship in the private sector is to maximize the customers' value to the organization by efficient acquisition, retention and penetration of customers. Strong customer relationship outcomes does not only depend upon successful relationship marketing tactics, but also upon consumer personality (Odekerken-Schröder et al., 2003). Gutiérrez et al. (2004) pointed out that the consumers feel uncertain and fear of the constructor's behaviour which tends to favour its own interest, and suggest that the problems of CCR can be distinguished into economic and socio-psychological approaches. Garbarino and Johnson (1999) recommend that, in order to satisfy the customers' demand on different kind of relationship,

the business organization needs to conduct both marketing approach simultaneously. Increased investment for customer satisfaction may adversely affect the firm's profitability in a short term but this kind of investment brings a long-term profits (Fornell et al., 1994).

RESEARCH OBJECTIVES AND METHODOLOGY

In the interest of the prospective markets of green buildings as well as the customer relationship analysis, it is perceived that advancing the study of CCR influences would be useful for examining of the consumer's relational commitment as well as building between customers and constructors in the GBM. As a part of multi-stage research, the main objectives of this paper are to:

1) provide preliminary overviews of the CCR's theoretical influences on GBM's operations.
2) preliminarily conceptualize a framework for assessing influences of CCR within the context of GBM development and retention.
3) create a preliminary structural model for conducting a further empirical study of CCR's influences on GBM's success.

Theoretical Framework

As this study is at its beginning stage, literatures are reviewed in order to investigate relevant theories by using the qualitative analysis method. Based on the studied literatures, theoretical constructs for the study of CCR's influence on GBM are presented in Table 1.

Table 1: Theoretical Constructs and Influencing Factors.

Major Constructs	Influencing Factors	Brief description
Green Building Objectives	Economic interests	Values, price, profitability
	Environmental concerns	Resource utilization, waste management
	Social perspectives	Stakeholders' health & safety
	Technology	Availability & affordability
	Innovation	Innovative products and practices
Consumer-Constructor Relationships	Impression/Appreciation	Relationships is valued
	Satisfaction	Consumers are satisfied with products & services
	Trust	Creating and maintaining trust among stakeholders
	Commitment	Engaging consumers' needs
Performance and Success of GBM	Consumer Acceptance	Green values recognized
	Voluntary Participation	Green initiatives supported
	Long-term Retention	Green products demanded

Research Hypotheses

Based on the derived theoretical framework, this paper suggests that deeper investigation on the influences of consumer-constructor relationships should be conducted. The following hypotheses are proposed.

H1: There are positive relationships between the objectives of consumers and constructors in the green building markets

H2: The shared objectives of consumers and constructors in the green building markets has direct influences on the their relationships.

H3: The shared objectives of consumers and constructors in the green building markets has indirect influences on the success of the green building enterprises.

H4: The strengthened relationships between consumers and constructors in the green building markets has direct influence on the success of the green building enterprises.

Methodological Framework

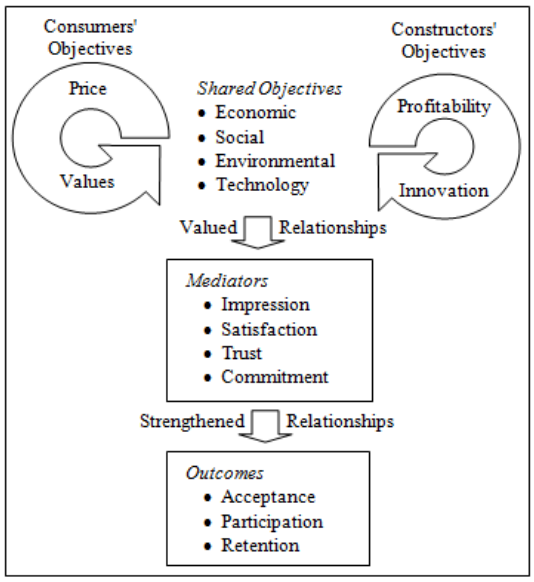
Having developed the theoretical framework by qualitative approach, the further stage of this study is to avail in more details the associated variables of the major factors within these theoretical constructs. A pilot study will be conducted in order to collect quantitative data and, then, analytical techniques such as factor analysis shall be employed to investigate for finalized factors and variables ready for use in further empirical study. It is planned to take the developed structural model into quantitative analysis, by means of structural equation modelling (SEM) analysis technique, using data from field studies and questionnaire surveys in order to further test, and verify the model before finalizing the model.

RESULTS: A PRELIMINARY INITIATIVES

A Conceptualized Framework for Assessing Influences of the Customer-Consumer Relationship (CCR) on Green Building Markets (GBM)

Within the conceptualized framework for assessment of CCR influences on GBM, factors related to green-building enterprise initiation and implementation are preliminarily identified. It is considered that fulfilling the mutually shared objectives through valued and strengthened relationships among them could have positive influences on the GBM success. The conceptualized research framework (as per objective no. 2 of this paper) is shown in Figure 1.

Figure 1: A Framework for Assessing the Influence of Consumer-Constructor Relationships in Green Building Markets.

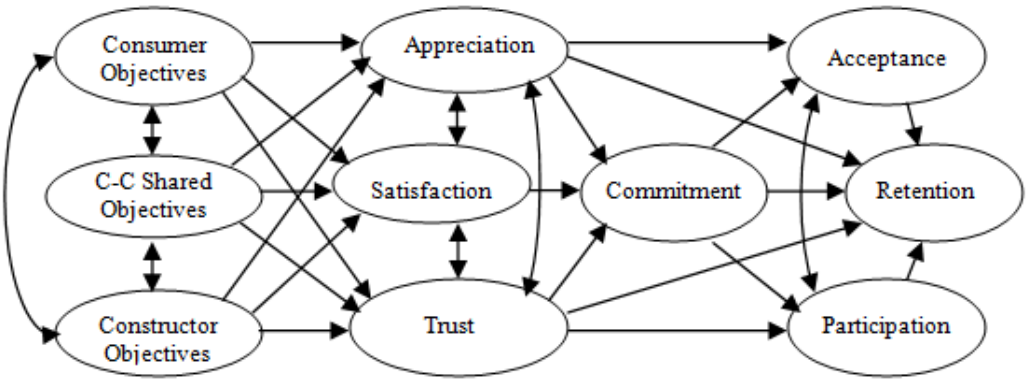


Based on the research hypotheses, emphasizing the CCR influences, it is hypothesized that the more relationships is learned, the higher shared value is gained, particularly in a short term, as it brings good impression and satisfaction while establishing trust and commitment among the interacting parties. Also, in a long term, it is hypothesized that the strengthened relationships lead to a positive outcomes in terms of customers' acceptance, willing to participation and their potential retention in the GBM.

A Preliminary Structural Model

Based on the preliminary conceptualized framework and the objective no. 3 of this paper, a preliminary structural model for assessing influences of CCR in GBM is developed, as shown in Figure 2. This starting structural model will be further tested (by means of the SEM analytical technique) for good-of-fit in order to indentify the final structural model that can assess CCR factors that have influences on the GBM success.

Figure 2: A Starting Structural Model for CCR Influence Assessment.



This conceptual model comprises major constructs (factors) of which contains relevant sustainability and relationship marketing variables used for measuring the influences of CCR at initiation, implementation, and continuations stages of green building business. Using SEM techniques will reveal causal relationships among these constructs and, hence, the significant paths of CCR's influences on the success or failure of GBM.

DISCUSSIONS

Similar to other kind of business, the relationship marketing is considered as an essential element for green building enterprises because customers' emotion in relations to satisfaction and marketing are important (Gountas & Gountas, 2007). In the green building market, attention should be even more paid to the attitudes and perception of consumers because, as suggested by Rainey (2006), their appreciation is a key role in the life cycle of products and it can make or break the process of green products' value creation. In the green building business environment, prospective consumers are likely to converge their concerns on social, economic, environmental, and business aspects. It was therefore aimed in this paper to preliminarily investigate possible links between objectives of consumers and constructors within the green building market environment.

From this preliminary study, it was learned that, while maintaining their objectives of business success, profitability and growth, the green building developers have to also focus on the customers' expectation on green building products. Besides attempting to gain the customers' appreciation, it is essential for the constructors in the green building industry to satisfy their customers in order to attain their trust, commitment and long-term loyalty. As pointed out by Gountas & Gountas. (2007), increased customer satisfaction not only enhances the green constructor's reputation but also leads to customers' loyalty and future transactions. Furthermore, at the beginning of the green building enterprise, applying sustainability measures typically results in higher costs. Only construction firms with strong financial resources can venture into such competitive market of green building (Chana et al., 2009). Another important problems in green building business is therefore how to attract the customers economically and persuading the customers (buyers or renters) to pay high amount of money to buy or rent green-building products remains the developers' dilemma (Yudelson, 2009). As such, as presented in this paper, the developed conceptual framework already puts an emphasis on considering the customers' emotional responses in terms of their perception and behavior. The next important task is to investigate more in details of relevant variables in examining influences of the CCR on GBM and integrate them into the preliminary structural model developed. Findings obtained from further field study and quantitative analysis shall provide a clearer picture how the affective experiences influence their behavior and perception during consumption interactions within the green building market, particularly in an emphasis of a long-term retention.

There is an important point to be considered when using the model developed in this study. One must understand that the situation of green building markets varies in different countries. In particular, the gap differences between developed and develop countries. Even among developed countries, GBM can face difficulty in successfully entering the market while GBM in several develop countries are promisingly growing due to strong cultural and political systems that support green building initiatives. On the contrary, sustainable development in developing countries tend to prioritize social and economic issues while neglecting the environmental concerns, as indicated by Shafii et al. (2006). In this regards, when assessing influences of relationship between consumers and constructors in green building industry,

there can be totally different results. As such, it is aware that the prediction of this model may not be generalized as global representatives. However, at the national or even regional level, it is expected that the developed model can be used to learn better of the CCR which would be useful for developing GBM's relationship marketing strategies.

CONCLUSION

In this paper, it was perceived that the success in green building business could largely depends on management of relationships between constructors and consumers. Importance of the relationship between green constructors and customers was studied providing constructors a brief overview how to to effectively interact with customers as well as to maintain their constructive relationships. This paper presents a conceptualized framework and a preliminary structural model to be used for assessing influences of CCR on GBM. The developed model integrates the sustainability facets together with the relationship marketing approach. Field examination of CCR influences shall be carried out in further stage. This study is essential for increasing understanding the interactive relationships of the main stakeholders in the GBM because it provides fundamental steps for constructors and consumers to value the affective needs of each other, which could lead to sustainable success of the green building enterprises.

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FROM WORK PROFILES TO WORKER PROFILES

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In developing new office environments and in improving the existing ones it is important to understand the end-user needs. In order to add understanding of the end-user needs a typology for profiling office workers is suggested in this article. Methodologically the research was carried out in two phases. In the first phase 21 interviews were conducted and a discourse analysis was carried out. The result of the discourse analysis was four orientations that the end-users applied in their talk about their working environment. These were named people orientation, territory orientation, object orientation, and system orientation. In the second phase, another set of interviews were carried out and a directed content analysis was used to analyze the data. One of the four orientations named above dominated 12 out of 14 interviews. This allows for the conclusion that it is possible to categorize individuals according to how they speak of their working environment. The persons in different classifications had an internally coherent ways of constructing the reality of their workplace and a common way to rationalize existing spatial solutions.

KEYWORDS: end-user profiling, workplace, content analysis, discourse analysis

INTRODUCTION

Buildings are built for a purpose: to support and shelter the human activities. Depending on how well buildings serve their purpose and produce good experiences for their users, they contribute to the efficiency of the user organization, the satisfaction of the individual end users and the achievement of goals for the businesses that occupy them. However there is a need to get more understanding about the user of the building and especially about the user experience connected with the building. (Blakstad *et al.*, 2010).

In order to get closer to emotional and cognitive aspect of workplace experience Inalhan and Finch (2004) have examined the concept of “place attachment”. Such concept is defined in various disciplines and they developed an effective conceptual approach, which can be applied to facilities management. They describe the development of a model-matchmaking process adapted from Passini's model of cognitive mapping (Passini, 1984). Findings in their study indicate that the emergence of the new economy is undermining our ability to form attachments with people, places and companies. However, one of the unintended effects of this is that it has strengthened the value of place and aroused a longing for community.

Moreover, loyalty to an organization is increasingly determined by social and place attachment.

Vischer (2007; 2008) has presented a user-centric model of environmental comfort and fit. The model links working environmental aspects to psychological aspects of employees. Her model concerns the fit between user and workspace at three levels i.e. physical, functional and psycho-sociological. In the model the user-environment relation is considered as dynamic and interactive. Circumstances where workers do not feel supported and need to make an extra effort to cope with barriers or to solve problems in their working environment in order to get their work done were considered stressful, energy-consuming and less productive (Vischer, 2008). Her model supports the analyzing of individual experiences especially from the perspective of well-being at work.

There are many initiatives in practice in order to identify and classify the work profiles of the employees in the organizations based on the way how they do their work and how do they use their workplaces. Such work style analysis is providing important input for workplace design. (Hardy *et al.* 2008)

The intention of this paper is to add yet another aspect to this discussion about the working environments in relation to the user experience. The aim is to look at working environment from the perspective of individual end users by investigating the workplace related talk. The individuals construct their understanding of the reality through speech, as suggested already by Foucault (1969; 2005; Berger, & Luckman 1966). This article assumes that it is possible to get a glimpse of these realities by looking at the discourses that the workers use when they talk about their working environments. The research question is: is it possible to categorize individual office workers by how they talk about their working environment?

The intention is to try to identify the specific discourses, which individuals use, when they talk about their working environments. The method used for this is discourse analysis. The material for the discourse analysis is collected by 21 transcribed interviews. The results of the discourse analysis offer insight into the different orientations that the end-users use when talking about their working environment. In order to find out if these orientations may be used to classify individuals a further content analysis was carried out. A separate data from additional 14 interviews was analyzed in the framework of the initial findings from the discourse analysis. Thus the material for this research consists of 35 interviews.

In the next section the two phases of the research are introduced. First the discourse analysis and findings from the empirical material of the first 21 interviews are presented. Then the second phase of the process is described: the content analysis and the results of it. Finally, some conclusions, managerial implications and suggestions for further research are provided.

IDENTIFICATION OF PROFILES BASED ON DISCOURSE

Phase 1: Discourse analysis

The method

Workplace change in facility management has been studied by using methods such as surveys, interviews, literature reviews and observations. The analysis methods range from content analysis, grounded theory to statistical analysis. (Ventovuori *et al*., 2007) It appears that discourse analysis has not been used widely in facility management.

Discourse can be narrowly defined as practices of talking and writing (Woodilla, 1998). More precisely, discourse is in fact the relations of talking, writing or otherwise producing a cultural "text", which can also be a picture, photograph, artifact and so forth. Text is the basic unit of data for discourse analysis. In this case, the texts are the spoken words of interviewees. In discourse analysis, it is essential to acknowledge the difference between spoken words and written ones. It is also essential to acknowledge that texts are not meaningful individually but only through their interconnection with other texts (Phillips & Hardy, 2002).

In our case the discourse emerged from the conversation between a researcher and an interviewee. In that sense, the researcher is also part of the study in discourse analysis. The researcher has a major part in constructing the social reality by asking questions that lead the interviewee to certain answers. The researcher is part of the data and subjective in that sense. When choosing a method of discourse analysis, the researcher is also binding himself to the tradition of the social constructionism (Lincoln & Guba, 1985; Guba, 1990).

Discourse analysis as a method is the analysis in itself, in other words the analysis is taking place while reporting the results, and thus the actual analysis is transparent in the sense that the results are the analysis; analysis has not taken place elsewhere and results are presented separately. However, some coding and classification had to take place in order to choose relevant quotations. (Jokinen, & al. 1993) In this article, the classification and coding the data was conducted by naming the sentences based on their features. These features were acknowledged based on:

1. their repetitive nature in all the data
2. their multiple meanings in relation to the context
3. their relevance to the subject of workplace

The quotations that are presented as examples were also translated into English, which may have altered some of the meanings presented in the original quotations. The samples were written in the form of spoken language and do not follow the grammar of written language.

Findings from the discourse analysis

It was possible to find four types of speech through discourse analysis. These types are called orientations. These orientations are object orientation, system orientation, people orientation and territory orientation. The following quotations from the empirical material written in italics present typical comments for each orientation.

1. Object orientation. A speech is object oriented if it points out something physical in the environment without contemplating the issue any further. A comment like "the open office is too noisy" is an example of object oriented comment due to the fact that the object and its qualitative attribute are in the main role in the spoken expression.

   I really hate the ventilation system.

   There are just not enough toilets so that I have to wait all the time.

2. System orientation. A system orientated comment is similar than object orientated comment, but it is augmented with analysis of the feature as a part of the larger functional system in the workplace. A comment like "the open office is noisy, but that is due to the discussions with team mates, which are important" includes the reasoning between the phenomena and the causes.

   I'm sitting by the path to the smoking place and it is noisy but I don't care – someone must sit there so why not me?

   The open plan office is noisy, but that is ok as it enables us to help each other.

3. People orientation**.** People orientated comment is an object oriented comment that is augmented with comments that relate the issue to the social context. A comment like "the open office is noisy because we like to chat with each other during the day" is a typical people orientated comment emphasising the social structure of the work environment more than physical features.

   In the beginning I was sitting in the middle of everything, now I'm in the border zone and I don't get as much social support that I'd like.

   The open plan office is great as I may spent the day with my friends and work at the same time.

4. Territory orientation. Territory orientated comment reminds an object oriented comment, however it relates the objects to other persons or groups. A comment like "the company offers the better places for the more important teams" is typical territory orientated comment including the tendency to draw a border between different workplace actors.

   This floor is not as appealing as the others. I think that is due to the fact that we are the most unimportant employees and they do not care if our workplace is ugly.

   Our team came from outside after this company bought ours. From various details you can see that we are less appreciated.

These orientations tell about the way people speak. The discourse analysis did not reveal if these orientations are used by everyone in the same manner or if every individual have one dominant orientation that he applies. In other words the discourse analysis does not reveal if the orientations may be used to classify workers in office environment. In order to find an

answer to this question a second set of data was gathered and analyzed. This second phase of the study is introduced next.

Phase 2: Content analysis

The method

Content analysis is a well-established way to analyse data (Neuendorf 2002). This method was initially a way to quantify qualitative data, and positivist thinking is behind many forms of content analysis (Hshieh & Shannon 2005). On the other hand, there exists also a strong tradition of more qualitative – and at the same time more post-positivist – studies that utilise content analysis (see, for example, Hshieh & Shannon 2005).

The starting point of every content analysis is the data – usually a text. Here the material consists of the interviews. The idea is to carry out the content analysis in a pre-decided, replicable and systematic manner. This study follows the guidelines of the so called *directed qualitative content analysis* laid out by Hshieh and Shannon (2005). The aim in directed content analysis is to validate or extend conceptually a theoretical framework or theory, in this case the orientations found from the discourse analysis. A directed content analysis is carried out in the following steps:

1) Key concepts or variables are identified as initial coding categories (in this case the four orientations).

2) Operational definitions for each category are determined using the theory.

3) The data is collected (in this case the interview material).

4) The transcripts are read through and everything that appears to be important based on first impressions is highlighted.

5) All the highlighted passages are coded using the predetermined codes. The data items that do not fit the categories are dealt with using one of two strategies: it is possible to code these as they appear or put them all in one big category to be coded later into either new categories or subcategories of existing codes. (Hshieh & Shannon 2005)

The first step in the setting of this study was to go through the data and sort out the comments and parts of discussion that are related to the predetermined categories (the orientations). In the case there were unidentifiable comments, they were included to the fifth unsorted category. After going through the entire material it may become clear that there are comments that constitute new categories. It is also possible that some categories do not come up in the interviews at all. Further it may become evident that some categories are so close to each other that having these as separate categories is not justifiable or a category may include just few comments and it may seem plausible to integrate it with another category. (Rasila 2010.)

Findings from the content analysis

All suggested orientations were present in the material. There were 138 object oriented comments, 120 system oriented comments, 84 people oriented comments and 51 territorially oriented comments. There were just a few comments which did not fit to any category and thus there was no need to do re-categorization.

In two interviews the comments were divided quite evenly to different orientations and thus it was not possible to find any dominating orientation. In 12 out of 14 interviews it was possible to find a dominating orientation. An orientation is understood as dominating if at least 40% of comments in individual interview may be categorized to this orientation and there are at least 10% more comments about dominating orientation compared to the second most common orientation.

Table *1: Percentage distribution of comments about orientations analyzed from the interview material*

INTERVIEW	OBJECT	SYSTEM	PEOPLE	TERRITORY
I1	10 %	40 %	45 %	5 %
I2	8 %	8 %	83 %	0 %
I3	57 %	9 %	8 %	26 %
I4	26 %	69 %	3 %	3 %
I5	22 %	25 %	47 %	6 %
I6	8 %	46 %	38 %	8 %
I7	9 %	15 %	44 %	32 %
I8	65 %	19 %	10 %	6 %
I9	22 %	37 %	33 %	7 %
I10	20 %	48 %	16 %	16 %
I11	29 %	53 %	18 %	0 %
I12	60 %	30 %	0 %	10 %
I13	63 %	25 %	0 %	13 %
I14	58 %	16 %	10 %	16 %
AVERAGE	33 %	31%	25%	11 %

In addition to the two interviews with no dominating orientation, there were three interviews which represented the people orientation, five interviewees, which could be identified as object orientated and four interviewees belonging to the category of system orientations. None of the interviewees were classified to the territory orientation category purely, even though this orientation existed in 12 interviews. One interview had both the territory and people orientated comments.

Based on the content analysis the orientation can be described further in the following way:

- **Object orientation.** Object orientated speech included the negative expressions connected to the workplace. The interviewees talked a lot about problems in the physical surroundings and issues which were bothering themselves or the others. For example, after telling about the poor air ventilation, the non-ergonomic chair and the poor lightning, the interviewees told that even though he himself did not suffer from the draft of air, the persons in the corner did.

- **System orientation.** System oriented interviewees also discussed the problems in their work environment but they had a tendency to find a justification for the situation. If, for example the office was perceived as noisy environments, this may be justified by the need for conversation between team members. A system orientated interviewees compared different aspects of the working environment and they were ready to trade some negative aspects of the environment to more positive ones. For example a system oriented interviewee was ready to give up her own desk if she may then choose to sit in a place where the lightning is good and makes her happy and satisfied.

- **People orientation.** The people oriented interviewees emphasized the social interaction to be the most important aspect of the working environment. Everything else was subordinated to the social aspect of the environment. If other interviewees complained about noise in the open office, the socially oriented interviewee complained about not being in the center of the social action and the noise was only a side-effect of the activity.

- **Territory orientation.** Even though in the sample there were not any territory dominated interviews, the territory orientation was strong in many interviews. Territory oriented comments were related to own space, floors in the building or teams in the same floor. In such comments the workplace was discussed in the context of the social status of the interviewee. There were also the comparisons: some team had better tables, they were assumed to be more esteemed by the management. Territory oriented comments were typically negative; the interviewee thought that she or they were worse than others and this was communicated through the physical working environment.

CONCLUSIONS

This article is based on the constructivist assumption that individuals construct their realities through speech. Thus, analyzing the speech allows us to understand how the individuals perceive their environment and construct their understanding of it. Following this idea this article studied the speech of 21 office workers. The material was gathered by interviewing these workers and a discourse analysis was carried out using this material.

It was possible to find four different orientations from the speech of the interviewees. These approaches were named system orientation, territory orientation, people orientation, and object orientation. The discourse analysis revealed the orientations, but it does not tell if the orientations are present in all workplace related speech or if individuals may be classified by

the way they talk. Hence, a second set of data was analyzed with a qualitative content analysis.

The content analysis of 14 additional interviews was carried out. The results reveal that 12 interviewees out of 14 did use one dominating orientation in their speech. Thus it was possible to classify interviewees' speech according to the object orientation, system orientation, territory orientation and people orientation. Persons in different classifications had an internally coherent ways of constructing the reality of their workplace and a common way to rationalize existing spatial solutions.

For example the persons using object orientation and territorial orientation talked mostly negatively about their environment. Typically the object orientated speech included statements about what is wrong in the working environment without providing rational reasons for these negative expressions. The territorially oriented speech rationalizes the problems in the working environment by comparisons. The reason for problems in the office may be found from the organizational hierarchy.

The persons with system orientation and people orientation perceive their working environment much more positively. They rationalize in positive terms the problems that the object oriented person brings up. A system orientation includes justifications problems by understanding the working environment as a system, which may not work optimally. Thus rational argumentation and reasoning is satisfying the system oriented persons.

The persons with people orientation reflect the working environment in a social context. If the working environment supports social relationships, it is functional. If it does not, the working environment is dysfunctional. The people oriented speech and system oriented speech included expressions which indicated that they may trade something bad if they gain something good in exchange.

Methodologically the categorization was not complicated. There was no need for new categories or restructuring the existing ones. This adds the validity of the first categories: two different methodologies and two set of research material were used (Riege 2003). However the interpretation of the results is still on the early stage and not generalized based on this limited amount of data.

For further research it would be interesting to test the orientations more and to try to identify if the orientations are constant. The possibilities to develop more tools to link such typologies to the work style typologies would add possibilities for workplace designers and managers to match the suitable workplace solutions for variety of worker preferences identified through the individual construction of the workplace speech.

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INVOLVING USERS IN THE DEVELOPMENT OF EMBEDDED TECHNOLOGY IN CONSTRUCTION

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Based on a project about user driven innovation and embedded technology in construction (BIIB), the paper discusses methodological issues on user involvement. In the paper especially focus is on the experiences on involving users in collaborative development of scenarios, in the validation of scenarios and in developing innovative solutions on a conceptual level. The project discusses 1) concepts of users and 2) methods for collaborative involvement. The first discussion involves presentation of an extended user concept and a discussion of differences between lead users and need-advanced users. The second discussion on collaborative involvement, discuss experiences with methods for communication across cultural and professional competences with reference to boundary objects, tangible systems and visualization. In the project four segments of situations for use of embedded technology in construction is analysed: the building process, professional operation and maintaining of buildings, tenants in social housing - and occupants/owners in detached houses. In the article the different methods for involving users are compared across these types of users.

KEYWORDS: embedded technology, user driven innovation, need-advanced users, boundary objects, tangible systems

INTRODUCTION AND BACKGROUND

Several studies has pointed out that embedded technology in building materials might have beneficially results: in the building process itself and for operation, maintaining, the residents and end-users (ERABuild, 2006) (Storgaard et al., 2007). In spite of high benefits for introducing the technology in the building materials it is seen that the marked alone do not drive this innovative development. In the building sector the client is seen as an agent for innovation, because of the ability to demand specific innovative solutions. In the case of embedded technology this has been questioned at the least on the Danish scene (Storgaard & Forman, 2009).

As stated in the above mentioned reports and articles, developing new products based on embedded technology in building materials is a case of complex products. This complexity means that a process of developing such a setup of a system of product, only with difficulty, may develop on market conditions only (Storgaard & Forman, 2009).

In a project on User Driven Innovation and Embedded Technology in Construction (BIIB) several of the actors in such a process of development were brought together[1]. The BIIB-project was carried out by the Danish Building Research Institute (SBi), Confederation of Danish Industry, Building Materials and IT and 30 firms from the organisation; respectively building materials manufactures and IT developer companies. The results of the projects was to produce a digital *Concept Catalogue* based on user driven innovation methodology and a *Guideline/Handbook for User Driven Innovation*, supporting firms wanting to include user driven innovation activities in their work with product innovation (van Heet Erve Grunnet et al., 2008).

By including the firms from the building material sector and the IT/embedded technology sector in the process of the project itself, the project also had the potential to create an internal readiness for the new type of innovations in the firms – both concerning the type of products – and for user driven innovation. Also the project – bringing the issue into play – potentially might be able to contribute to the establishment of a readiness in the external world, including the marked.

Especially in the building material industry, the challenges for the participating firms were many. They had to participate in *collaborative innovation* with external firms from another sector/branch (the embedded technology branch), they had to learn about the new technology and the potentials for their specific future line of products; and they had to learn about how to cope with user driven innovation.

The challenges for the BIIB-project were hereby high on all three themes: To construct a method for developing complex products based on inter-firm collaboration. To generate the making of digital concepts based on a process of user driven innovation involving both users and firms. And to suggest methods for user driven innovation adaptable for firms in the building industry. These methods should have a high focus on tools supporting collaboration and knowledge sharing across boundaries between stakeholders differing in competences and background – e.g. between firms and users, between firms from different branches, and between persons and departments in the single firm.

Embedded Technology as Complex Products

In construction ICT has been discussed and analysed for many years, for example as the Intelligent House or the Smart House and real-life experiments with smart technology in buildings has been seen (Moltke et al., 1997) (Ambrose & Nielsen, 1997). As the technology has evolved through minimization and capacity expansion focus has been on embedded Technology. Here RFID-tags[2], micro-sensors (Sensortec, 2011) and Home Information Systems as CST[3] have been on the agenda.

As described in Storgaard & Forman (2009) the combination of local embedded technology and devices with information based on the Internet has widened up the perspectives for using embedded technology in buildings – and for the whole process of digitalisation in construction. Jaselskis et al. (1995) had already in the mid-nineties stated that the RFID technology was especially promising for the construction industry because it "*can be*

[1] The project, Brugerdreven Innovation og Indlejret teknologi i Byggeriet, BIIB, is financed by support from Governmental funds on User Driven Innovation.

[2] RFID (Radio Frequency Identification) (ERABuild, 2006: 14) (Bassi & Parand, 2002).

[3] CST systems are intelligent semiautomatic systems, which might be operated through the internet and mobile devices as the cellar phone. (Storgaard et al., 2007).

integrated into systems that can track materials, identify vehicles, and assist with cost controls" (Jaselskis et al., 1995). A position which was taken up in the ERABuild Organisation (European Research Area in BUILDing) as investigated in ERABuild, (2006). On the European scene several other initiatives has been taken to stimulate the innovative development in the construction sector based on a smarter use of ICT and embedded technology. In EU the ROADCON project provided inputs for the RP6, identifying key actors and preparing cooperation (Hannus et al., 2003). In 2005 the ECTP (European Construction Technology Platform) was formed to provide input to the RP7 and embedded and ambient technologies played a significant role in the recommendations[4].

To understand the process of innovation combining products from two sectors - the building industry and the ICT-sector - it may be fruitful to see the new products as complex products (Storgaard & Forman, 2009). In accordance with Gann & Salter (2000) the need for at collaborative innovation process between many actors and firms create conditions for innovation which are very different for innovation in the individual companies (Gann & Salter, 2000: 957). An important aspect of such new complex products of new mixed technologies is that the agents of the future, which would drive a demand in the marked, often will be completely missing when the innovation process may be started (up cit. p 959).

In the case with embedded technology in construction this explains why an innovative process of integrating embedded technology in building materials has not been seen. And it brings an understanding of which elements should be brought together if such a process should be seen. This may include stakeholders from the building material industry and technology firms, architecture, design and consultants, users on the building site, client, operation and maintenance, users of the building, and even from the regulative body, finance etc.. (Storgaard & Forman, 2009: 137).

In the BIIB-project it was the intention to set up a process of innovation, based on a process of collaboration between the actors. This process should hereby not only include the technology actors or the user, but include external stakeholders as well – both stakeholders which had a role to play in a new setting where new products has been developed – but also actors in the existing setting, where a change in role and functions may occur.

USER DRIVEN INNOVATION

In the Scandinavian countries there is a tradition for involving user in product innovation, especially in the ICT fields in "The Scandinavian Traditions for Participatory Design" (Wise & Høgenhaven, 2008). But also strong international firms as Danfoss (Heating systems) and Lego have involved user in their work for innovation in products (Bisgaard & Høgenhaven, 2010). In Denmark two programs for user driven innovation was established: A research program for Strategically Research (Forsknings- og Innovationsstyrelsen, 2006) and an Innovation Programme for User driven innovation (Erhvervs- og Byggestyrelsen, 2011). At the Nordic level Nordic Innovation Centre launched a programme for user driven innovation (Nordic Innovation Center, 2011). Central in all initiatives is the understanding that involving users in the work with new products, hidden knowledge may be discovered; e.g. knowledge about unacknowledged needs, ways of using and handle the products, context in which the user consume the product.

[4] PICT (Process and ICT) was Focus Area no 7 in ECTP (ECTP, 2011)

There are many different ways of involving users, which are all known as user driven innovation. What separates the different approaches is why the users are involved. Overall users are either involved to figure out WHAT to offer the users or HOW to produce it (Wise & Høgenhaven, 2008). Involving users to find out WHAT to offer them, will often happen in the beginning of the innovation process and it involves trying to understand both acknowledged and unacknowledged needs. Acknowledged needs means that the user has a clear understanding of which problems are experiences, while unacknowledged needs is when the user is not aware of what the problem is or cannot articulate it. Involving users to find out HOW to produce a product or service will happen later on in the innovation process, and therefore it involves explicit and acknowledged needs and it often is based on participatory design (Bisgaard & Høgenhaven, 2010).

In BIIB the primarily focussing has been on the WHAT to offer the users phases, while the phases regarding HOW to produce it is assigned to the firms from the building material sector and the IT/Embedded Technology sector.

AN EXTENDED CONCEPT OF USERS

Identifying the actors participating in user driven innovation the BIIB-project has involved four types: end-users – other stakeholders – developers – and the project team. Each part has an important function in developing innovative products. And each part has its own cultural and professional competences, agendas and interests. In the BIIB-project it was the intention to bring the actors together in a collaborative process. Therefore the need for tools for communication and knowledge sharing across these social settings was high.

From Lead users to Need Advanced User

Central in the understanding of how to work with users is the concept of lead users, originally lanced by von Hippel (1986) and von Hippel & Katz, (2002). For von Hippel, lead users were in front both concerning their needs and in finding solutions to those needs. Therefore involving lead users in defining needs and finding new solution to these was an important method for stimulate innovation on new product. Bisgaard & Høgenhaven (2010) take the involvement of lead user a step forward. They separate a group of lead users which work in a professional setting to innovate for and with the company in order to commercialise their products. These lead users they designate Advanced Users (Bisgaard & Høgenhaven, 2010). Storgaard & Forman has used the same designation, advanced users, for users which are in the forefront concerning needs, but often not concerning technological based solutions (Storgaard, 1998: 99) (Storgaard and Forman, 2009: 141). Here they often will be on front at a structural pattern; they possess the needs of tomorrow on a scale not immediately connected with technology. They may have demands to life – family, children, leisure time, working life, personal development etc, - that only difficultly can be solved in today's setting (Storgaard, 1993). One have to distinguish between Technological Advanced User - TAU - to designate the Bisgaard and Høgenhaven situation; and to use the designation of Need-Advanced Users - NAU - to designate the Storgaard et al. situation.

Selecting the Users

Often the end-user is defined as the actor, which at the end consumes a product. In construction one often identifies this as the user of the buildings – ex tenants (in homes) or employees in offices. But actually the whole value chain may be users of embedded technology enriched building materials. In BIIB four scenes and segments of end-users was selected:

1. In the building process: The men/women at the building site; workers and building managers
2. In building operation: The professional operators and services providers
3. In dwellings: Tenant and administrators
4. In detached houses: Tenants, which also is owners, operators and investors

These users was seen as end-users, which might benefit from the new type of building materials – but benefitting on different topics and needs. These end-users were not typical lead users in the traditional understanding of the concept. Most of them were not interested in the embedded technology at all; they were experts – not on technology, but on their own life and setting; in needs and contexts. In the BIIB interpretation they were NAUs.

Especially in the detached house segments some of the users did have a special interest in part of embedded technology (heat and ventilation) and in devices and ICT systems, and thereby being lead users. In one of the household the involved person might even be seen as a TAU. Also on the building site actors with a special focus on the technological was involved as well as actors with focus on supplementary technologies (digitalization in Construction ex BIM). On the building operation segment one of the involved persons was used to CST and thereby also might be seen a TAUs.

Thus the end-users involved in BIIB included especially need advances users/NAUs (all of them) and lead users including two TAUs (in the detached house segment).

Selecting other Stakeholders for Validation of Scenarios

The success of innovation is not only a case of needs meeting the right solution, based on collaboration between developers and users. A chain of external stakeholders do have significant importance, ex as part of legislation, insurance, finance, purchasing, designing, advice as described before. In BIIB such external stakeholders was invited to participate in validation of the scenarios, where context, needs and solutions was presented. In BIIB they had been represented by people from construction, organization for business and for unions, architecture and design, consultancy, assurance, building legislation, research, clients and FM operators. They participated in the Dialogue Meetings. Here scenarios were validated and concepts of new product based on embedded technology in building material were collaboratively developed.

The Developers

The firm participating in the projects was given the role as leading agents concerning technical themes on embedded technologies and building materials. On turn they were part of the teams which participated in the focus groups meeting. Their role was to be technical experts, to follow up on reactions from users and stakeholders, and to contribute to the collaborative development of concepts. At the strategically level the firms did have an interest in participating in the effort to stimulate an innovative development of intelligent products - when it first was started up. But how long would these collaborative activities go, when real innovative solutions were to be developed? In the BIIB-project this barrier of interfirm competition was planned to be encountered through a focus on developing concepts – and not final end-products competing in the market. Throughout the project another severe barrier developed, which could not be taken care of in the design of the project: the financial crisis. When the project was designed and started up, high conjuncture in the economy was the situation. But soon after the start-up of the BIIB project, the international economic crisis ran over the western economies and a rapid decreasing marked for the building sector, including the building material market, was soon seen. Immediately the crisis diminished the

resources for innovation in the firms – but at the same time it increased the need for innovation. For the BIIB-project it had the consequences that most firms had to economize with the resources they could put in the involvement and some firms even had to leave the project because of insolvency.

The Project Team

The project Team included staff from the organizations behind the consortium – that is from the two branches of the Confederation of Danish Industry (DI Building Materials, DI ITEK) and for the research institution (SBi, Danish Building Research Institute, Aalborg Universities). Their task were to manage the project (the two branch organizations), to investigate, research, evaluate, documentation and report (the research institution). And the Project Team had to facilitate the meeting between end-users, stakeholders and developers, and to participate in the collaborative process of innovation of concepts. As a research project it was action research. As an innovation project it was a collaborative project across the borders at least on three different dimensions: 1) Between users, other stakeholders and firms, 2) between (in principle) competing firms, and 3) between agents from the commercial sector and from research. In these ways the project team was standing before challenging tasks – across boundaries.

METHODS TO STIMULATE PARTICIPATION AND COLLABORATION

The main methods for setting the frames for collaborative process between users, stakeholders, developers and the project team in BIIB were “focus groups” and “dialogue meetings”.

Focus groups meetings were used to analyse and understand the need of the users, the context and to give room for possible solutions. It was a meeting between users, developers and the project team. Data and information was gained through help-tools such as “pre-meetings”, “interviews”, “walk through” and “photo safaris”. The results was analysed and formulated in scenarios illustrating context, user, needs and solutions.

Dialogue meeting was used to validate the scenarios and to start up the process of developing concepts of new embedded building materials. In the meetings users, an extended group of stakeholders, developers and the project team participated.

Boundary objects and tangible systems

In a process of exploring a design of needs and solutions based on collaboration between agents with differences in social context, competences and interests (the firms are competitors), there was a need for methods which supported the process of communication and knowledge sharing across these cultural boundaries, competences and interests. Besides, the methods should also support the understanding of future yet not existing solutions seen in a pattern of needs which at the time only may to be found in the form of “germs and seed”. A dialogue and sharing of knowledge, assessments and beliefs may easily become very abstract and difficult to make explicit – being on edge of a future which only are at a state where it might be going to be made realized.

Boundary objects was used by Star & Griesemer (1989) to describe objects which were suited for translation between different social settings. The objects had structures which allowed the different segments to recognize the topic. And it was so weak that it allowed different meanings between the segments. Later on Carlile defined it as question on a syntaxial, a

semantical and a pragmatical approach (Carlile, 2002). Adding the pragmatical dimension Carlile emphasized that knowledge was localized around, embedded and invested in problems in practice. As such only boundary objects, which facilitated a process where individuals voluntary and jointly transform their knowledge between segments, would be effective. In his study of knowledge sharing in the industry Carlile analyzed how knowledge is structured differently within the four primary functions in a firm (sales/marketing, design engineering, manufacturing engineering, production) and how it is communicated and shared across these boundaries. Based on the study he describes knowledge as localized, embedded, and invested in specific practices (with reference to (Bourdieu, 1977) (Lave, 1988)) and he sums up that a boundary objects should support the establishment of a common a shared syntax, create a semantic which provides a concrete means for individuals to specify and learn about their differences and dependencies across a given boundary (Carlile, 2002: 451). And it shall facilitate a process where individuals can jointly transform their knowledge (up cit p. 452). In his case study especially CAD drawing functioned as an effective boundary object. But boundary objects are *no magic bullet*, as he expressed it. Problems and humans do vary. "A CAD can be effective communication tool in one meeting, then a bludgeoning tool in the next" as he cites one of his case study persons for. (up cit 452).

In the Danish construction sector the partnering process was analyzed with a special focus of knowledge sharing between Communities of Practices (Koch & Thuesen, 2009). For them the success of knowledge sharing is the redundancy in information mediated through boundary objects and actors/brokers. They mention that boundary objects in the process may be tangible or nontangible. Drawings have a special tradition in the construction communities of practices as one of the most used type of boundary object.

In Software Engineering, especially in HCI (Human Computer Interaction) and in design, tangible user interfaces and tangibility has become an important issue (Hornecker, 2005) (Brandt, 2005), (Walenstein, 2003). "Things to think with" (Brandt, 2005) and the growing experience how this tangibility did help the design processes between different agents in a collaborative process in learning, sharing and designing has been widely recognized (Hornecker, 2005). But why these tools really do work, only little research based knowledge exists. There is still a lack of theory about why tangible interactions work so well (Dourish, 2001, from Hornecker, 2005).

An understanding of this strength of tangible systems and grounded object may be seen in Storgaard (2005) explaining the strength of visualization in collaborative knowledge sharing by the Nonaka (1995) – Takeuchi SECI model approach, embracing the effect of the visual element in sharing and learning both tacit and explicit knowledge (Storgaard, 2005: 285) (Nonaka and Takeuchi, 1995).

EXPERINCES FROM THE METHODS USED IN BIIB

Focus Groups Meetings

To collect data about the four segments of situations for use of embedded technology in construction in order to find out WHAT the firms should offer them, the method "focus group meetings" were used. The traditional focus group meeting, where one get different stakeholders together and ask their opinion about a certain topic, was combined with ethnographical methods such as "interviews", "walk through" and "photo safari" (Erhvervs- og Byggestyrelsen 2, 2010). Focus group meetings were used to get an understanding of the end-users and the context in which needs existed in and where solution and potentially new

products were to be used. In BIIB the focus group meetings were conducted as a facilitated workshop, where the end-users met the developers and the project team. The meeting took place at the end-users own territory (home, work space etc.). In all cases except the case with detached houses there were pre-meeting with key-persons from the user group before the focus group meeting itself, and a follow up post-interview afterwards.

Pre-Knowledge and Readiness

Pre-meetings were conducted with selected key-persons with formal/informal administrative responsibility in order to create readiness and pre-knowledge for all involved. It prepared the administrators about what was going to happen at the focus group meeting and it gave the project team pre-knowledge about the setting. For the user part it minimized the uncertainty about the topic, the methods and what was going to happen. For the project team it showed up to be of even importance, by giving it hands-on knowledge about how to organize and facilitate the specific focus group meeting according to organizational, social and personal aspects.

Individual Type of Users and Developers Setting the Demand for Facilitating

In BIIB it was experienced that the facilitation and the organization of the focus meetings highly depended on the types of end-users and stakeholders who participated. It was our experience that end-users preferable should be need-advanced users, who were experts within their own field being the home or the work space. At the individual level they should be open towards letting strangers into their private sphere, to participate in a dialogue in a public domain and to express themselves and their views. Tenants in social housing for example were innovative and inventive in a different way than high-end occupants in detached houses, who were much more self-expressive and full of ideas. The reason for this could be that the high-end occupants besides being Need Advances Users, also was lead-users with technical expertise. The developers participating in the focus meetings were technical experts from both the building material firms and IT firms. They provided inside knowledge to the end-users about what was actually possible and they made follow-up questions on the need and use. The developers not only represented their own special niche production, but in principle the entire branch.

Generally the BIIB-project showed the importance of a solid and robust script for the meeting and a facilitation which were responsive to not only to the stipulated tasks, but also to the individuals participating. An important function of the facilitators turned up to be the ability *to play ball* between the different actors, and get them all involved. Thereby it was not necessarily negative to have different personalities (e.g. introvert and extrovert) present, since they all contributed with different aspects. Sometimes it even emphasized the group dynamic since different personalities could supplement each other better.

Post-interview to get clarification was used when needed. This meant that iterations during the data collection phase often were seen.

Focus Group Meeting as an Effective Low Cost Method

Based on our experiences it can be concluded that focus groups meetings were a simple method to obtain a good understanding of the context, functionality, needs, and possibilities. With the right competencies, the project team could acquire a fair amount of knowledge about the context and functionality with a very small effort. A skilled project team with hands on knowledge about their customers and the users – as many small firm developers often possess - do not require a lot of investigation and documentation to identify new needs and possibilities. Therefore focus group meeting may be an effective low cost method in many

situations. But if the scene is new or if one wants to investigate all corners and hidden spots of use and need, more resources are needed.

Having prior knowledge about the field which is being investigated, may both be considered a strength or a weakness. It may be a strength since it made it easier to understand the interplay between context, needs and new solutions. But at the same time it may weaken the ability to be objective and identify domesticated and hidden aspects because of selective perception.

Dialogue Meetings

In order to validate the data collected at the focus group meetings and to generate new ideas and concept, BIIB held dialogue meetings where end-users, who participated in the focus group meetings, developers and stakeholder from the entire value chain, participated. The dialogue meeting lasted 1-1½ days, and consisted of different presentations and exercises such as scenario assessment and design games. The presentations dealt with subjects relevant to the topic of the dialogue meeting and served the purpose of providing knowledge to the participants so that they all had a foundation to participate in the different exercises.

Room for Collaboration, Competitive Games and Refreshments

The setting should stimulate active participation; it should be fun to participate but the subject knowledge should not be undermined. The fun factor was stimulated by dividing the participants into groups, competing against each other in order to win a small award. This was well received by the participants who took on the different task with great enthusiasm. Another way to stimulate the participant was to nurse them with refreshments, breaks and reshuffles (change in group formation, table/room layout etc.).

Need for Customization of the Meetings

Every dialogue meeting had to be customised to the segment of participants and the purpose of the meeting. As an example the size of the groups during the exercises depended of the purpose. It was our experience in BIIB that larger groups work well for brainstorming and validation on a broad scale, while smaller groups were better at clarification and specific conceptualisation. However, this was just a thesis since it has not been explored in regards to other topics. It worked well when the project team and the facilitator played active roles during the exercises and participated along with the other participants. This was a more indirect way to facilitate, but it was our experience that it stimulated to a better dialogue and made the exercise less scary and more approachable to the participants.

Setting the Stage for Dialogue by Using Visualized Scenarios

One of the help-tools used at the dialogue meeting in order to validate the needs, and possibilities identified at the focus group meetings was scenarios, functioning as boundary objects. Scenarios are a fictive description of a likely / the most likely future scenarios and the consequences they might have to the users (Erhvervs- og Byggestyrelsen 2, 2010). The scenarios described the identified needs in a social context and suggestions as of how to fulfil the needs. The scenarios were validated by the participating firms and other users from the extended value chain at dialogue meetings. Dialogue meetings was/ the framework in order to create dialogue, inter-firm collaboration and readiness in both the internal and external world. The dialogue meetings was/ also used to generate concept ideas and for conceptualisation. The main method for doing so was design games. A design game is a creative brainstorming game customised to the specific users in order to involve them in developing new ideas that solves the identified needs and wishes (Horgen et al., 1999).

Since visualization was a key aspect in BIIB, the scenarios was presented on posters illustrating a roll of film showing selected scenes and an appurtenant text. The scenarios were posted on the walls in the beginning of the meeting to draw attention and set the stage, and during the assessment, the scenarios were put on the table in front of the participants, so that they could draw on it or put post-its on it, following the assessment step by step. During the assessment the participants were asked to validate the needs, solutions, users and implementation. This sometimes brought forward new needs or adjustments to other needs, and therefore there were some overlap / iteration with the previous phase of collecting data.

Experiences from BIIB showed that the visualized scenarios were crucial in order for different participants with very different background to understand context, needs and solutions. In other words the scenarios succeeded in the function as boundary objects. Both the pictures and the text were a good way to get the participants to understand e.g. a complex technology and other things that might be difficult to describe and understand. By making the visualized scenarios the participants did not only get a better understanding of the technologies and needs; they also got an impression of the realism since the scenarios took place in a specific context. The visualized scenarios provided the different participant with the same qualifications and understanding, which allowed them to enter into a constructive dialogue and collaboration on concepts, which actually broad new aspect forward.

Developing Complex Products by Using Design Games

Design games are a help-tool to concretise abstractions, ideas and concepts. The games functioned as boundary objects with a tangible element – cards to be drawn, post-its to be written and placed. By giving the participants different task, which were related to the chosen subject (e.g. the building process), one set the framework for collaborative innovation. The tasks varied depending on the subject and the purpose, but some examples of tasks were to define problems in a given context, to develop new concepts based on identified needs, to redesign existing products and to sketch new products, based on new identified needs, to explore the effort needed in order to implement new concepts etc.

Experiences from BIIB showed that design games created dialogue and got the participants to collaborate. Just as with the focus group meetings it was in the best favor if the participants functioned as extroverts, optimistic, visionary and open. The participants should both be experts of their everyday- and work life, and representative of their own professional competencies / profile. However, the whole setup of the design game combined with a skilled facilitator forced all participants to participate actively; they could not withhold passively. However, for some participants (e.g. need-advanced users) it could be hard to come up with new ideas, but our experiences showed that their input in form of comments about functionality and context could trick others to get inspired. The interaction between different stakeholders from the entire value was highly valuable.

CONCLUSIONS

The methods used suited their purpose well.

Table 1 summarises what was learned about the different methods used, and what others should be aware of in regards to different types of actors if they were to use the methods.

The scenarios were based on the results from the explorative dialogue in focus group meeting between users, developers and project team. Here were used illustrated cards and plates as methods to supplements the interview themes as means for enforcing knowledge sharing and

Table 1: Summary of experiences about different types of actors in regards to different methods

Methods/Actor Type	End-users	Other Stakeholders	Developers	Project Team
Pre-Meetings	Matches of expectations Creates reciprocal, readiness and pre-knowledge			Knowledge to organize and facilitate focus group meetings Matches of expectations Creates and reciprocal, readiness
Focus Group Meetings	Preferable need-need-advanced users Letting strangers into private sphere Express themselves publicly Expose life, needs, problems etc.	No participation	Technical experts Represent the entire industry Should be open and curios Opportunity to see own products in use	Facilitate the meeting Created peace of mind and confidence for the participants Actively involve all participant Prior knowledge about the context is both strength and weakness
Post-interview				Opportunity to ask follow-up questions
Dialogue Meetings	Foundation for participation is given through presentations Participation of selected end-users, and stakeholders from the entire value chain		Provides them with an opportunity to learn about context and functionality, and to generate new ideas and concepts Need tangible ideas and concepts in order to justify participation	Location and setting is key Meeting should be customized to the segment of participants Good with indirect facilitation to hide facilitator role
Scenarios	Visualization made it easier to understand context, needs and solutions Visualization provided everyone with the same qualifications and understanding			Visualization is key to create dialogue
Design Games	Participants should preferably be both be experts of everyday- and work life, and representative of own professional competencies / profile Interaction between end-users, different stakeholders from the entire value and developers is valuable			A skilled facilitator should encourage all participants to participate actively

collaboration. The methods worked well and gave a fine platform for constructing the scenarios. At the dialogue meetings scenarios was used to support the understanding of social context, needs and solutions and knowledge sharing between users, developers, other stakeholders and the project team. The visualized scenarios functioned as boundary objects and were crucial in order for different participants with very different background to understand context, needs and solutions.

Design games were used in the collaborative process of *developing concepts* for the new products which took place at the dialogue meetings. They functioned as a help-tool to concretise abstractions, ideas and concepts. The games may be seen as boundary objects with a tangible element – cards to be drawn, post-its to be written and placed. The collaborative process succeeded in getting the active participation across disciplinary and cultural boundaries.

Illustrated cards, scenarios and design games as well as the post-its and the table and wall sheets may be seen as boundary objects with an element of tangible systems concerning the hands-on situation which was partly established in the design game situation as well as in the use of post its. In BIIB the experience was that these combinations of boundary objects and tangibility worked well to establish knowledge sharing across the social and disciplinary boundaries. But these methods do not work alone. Facilitation still becomes an important issue. Responsiveness, improvisation and the grasp on situations and individuality are by no means not important when using these methods. But a good script and the use of tangible objects is an important step.

In BIIB it was found that the end-users actually were active and willing to expose themselves, their lives, and needs at the focus group meetings. The project identified different aspects of their life, and the interplay between interview, dialogue and actual showing of the context worked well. The other stakeholders did not participate in the focus group meeting, but participated actively in the dialogue meetings in order to validate scenarios and to generate ideas and concept.

The participating developers were in a very difficult situation because of the financial crisis. This meant that the participating firms had fewer resources to invest in the project than expected. It was found that it was very important for the developers to get tangible ideas and concepts to bring home to their companies since it justified their participation in the dialogue meeting. Despite the economic crises which intensified competition between firms and augmented the need for innovation, it is the conclusion that most firms welcomed and continued the collaborative process perhaps because of potential for branding, for getting new inspiration, learning about the new technology, learning about user involvement, or getting possibilities for match-making with other firms. Already half a year before ending the project at least one product was demonstrated, and 6 firms had participated in commercial match-making activities on new embedded products facilitated by the BIIB project.

The project team got a more active role than expected since they were both facilitators and participants in the collaborative innovation process. The facilitator role was of great importance since it, in interlay with the tools of boundary objects and tangible systems activated the participants. A good and robust script is important. But facilitation must be responsive not only to the topic, but in a high degree to the type of participant on an individual level.

One of the main purposes of BIIB was the process itself, since one of the goals was to suggest methods for user driven innovation adaptable for firms in the building industry. The main methods used could be scaled to fit the participating firms in building materials manufacturer and in IT developer companies. The project recommend companies to try these methods, because it was experienced that these methods were actually capable of stimulation knowledge sharing between users and developers, inter-firm collaboration, and dialogue between different stakeholders across professional, personal, and cultural differences.

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CONSTRUCTION PROCESS RELATIONS: EMPIRICAL STUDY OF FORMS OF CONTRACTS IMPACT ON PROJECT SUCCESS

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This study sets out to investigate the impact of different forms of contracts impact on the project outcome, through a multiple case study of construction projects. Generally a project may be regarded as successful if the building is delivered at the right time, at the appropriate price and quality standards, and provide the construction client with a high level of satisfaction. However, as much as 60-80% of the gross work done in the construction industry involves the buying-in of material and services from suppliers and subcontractors, for which reason they have a heavy impact on most kinds of construction products. Therefore much effort is spent on procurement procedures with competitive tendering and fixed price, in which the client first specifies the product as thoroughly as possible (i.e.fixed design) and then evaluates a large number of bids. In Sweden construction contracts between the client and the main contractor are mostly based upon two form of contracts such as, the AB 04 (Design Bid and Build) and ABT 06 (Design and Build). The result of this study indicates that the projects success is not depending on the form of contract. Of more importance is that construction client's recognize the positive and sustained contribution they have to make if buildings of excellence are to be the norm rather than the exception

KEYWORDS: Form of contract, Project management, Project relations, Governance, Procurement,

INTRODUCTION

A project may be regarded as successful if the building is delivered at the right time, at the appropriate price and quality standards, and provide the construction client with a high level of satisfaction. As much as 60-80% of the gross work done in the construction industry involves the buying-in of material and services from suppliers and subcontractors, for which reason they have a heavy impact on most kinds of construction products (Dubois and Gadde, 2002, Miller et al., 2002). Generally, the procurement strategy is therefore considered to bee important for the success of a project. The procurement strategy identifies the best way of achieving the objectives of the project and value for money, taking account of the risks and constraints, leading to decisions about the funding mechanism and asset ownership for the project. One part of the procurement strategy is to choose a suitable form of contract which aims to improve the quality and cost-effective delivery of clients' projects through incentivising the whole supply team to perform better and requiring clients to consider the individual risks involved with any construction project carefully.

A contract is a way of creating a project organisation according to Levitt and March (1995) by transforming a conflict (political) system into a cooperative (rational) one. However Loosemore and Huges (1998) argue that standardized procedures are more helpful when the

nature of the task is simple, whereas as task complexity and time pressure increase, standardized procedures can become restrictive and counteractive. Similar view is presented by Turner and Simister (2001), they advocate that it's not the risk per se which determines the appropriate type of contract, but uncertainty of the eventual product and the need for goal alignment. Evidently, greater involvement and interaction between client and consultants is important for more effective project process (Love et al., 1998). Similarly, Eriksson (2007) states that construction clients need to actively invite the different participants earlier in the construction process, that is, the focus should be on the actual process (how), not typical solutions (what) (Bertelsen et al., 2002, Frödell et al., 2008).

Similarly, Chan and Chan (2004) and Baccarini (1999) suggest two levels of measurement for project success; the first is an objective measurement such as time and cost related to the specifications in the contract. The other level of measurement contains of a more subjective dimension, for example expected quality (both client and users expectations) and functionality. Collins and Baccarini (2004) claim that the objective dimension is connected to the project management success and the subjective to product success, that is, the effects of the project's final product. Shenhar et al., (2001) differs between two distinctions; operational projects and strategic projects were the first has focus on getting the job done and the latter on achieving business result. Poor definition and weak articulation of product requirement may, however, result in dissatisfied customers even when project specifications are fully met (Atkinson, 1999).

To further understand how different form of contract affect project performance this study sets out to investigate the characteristics of the construction process and the management of relations in the construction process in relation to the two main forms of contract used in the Swedish construction sector.

THERORETICAL FRAMEWORK

On form of contracts used in Swedish construction projects

In Sweden different systems and regulations are widely used in the construction process. Case studies made by Kadefors (1997) and Borgbant and Apleberger (2008) reveal that institutions in building projects, such as governmental regulations, the tendering system, roles and interest organisations, formal standardisations initiated by the industry, standardisation of skills and knowledge and learning and routine, affect the degree of information process and management needed for changes of the construction process. The strong institutions are, according to Kadefors (1997), related to a great need for coordination and communication in complex project organisations. These institutions can create preconceptions of predefined roles for participants entering the project and obstruct the integration of the professionals' contribution (Murdoch and Huges, 2007). Dacin et al. (2002) mention that there was significant variation in the level of institutionalisation of the same practice across countries as well as across organisation units. This shows that there is a need to scrutinise the characteristics in each specific project before deciding on form of contract to use.

Swedish construction contracts are frequently based upon standard rules worked out jointly by client federations and the Swedish Contractors` Federation. For example, the AB 04 (Design Bid and Build, DBB) regulation is applicable to contracts in which the client has the main responsibility for the design of the project, whereas the ABT 06 (Design and Build, DB) regulation is applicable for contracts where the responsibility for the design is distributed to

the contractors. DBB is also used as a form of contract for divided contracts. Both of these contract regulations, DBB and DB, are mainly based on classical transactional models of governance. Accordingly, they attempt in detail to spell out the responsibilities, authority, and compensation of each part in detail. The use of standardised contracts thereby enables parties to reduce the emphasis on specific contractual terms during the negotiation process. However, they also create difficulties for clients to assess the tender of a specific project since the comparison of tenders is based on the predefined apportionment of risks (Murdoch and Huges, 2007). This leads to a focus on price when evaluating project bids (Eriksson and Laan, 2007, De la Cruz et al., 2006, Tan et al., 2008), rather than evaluation parameters reflecting the contractors resources and competence, size and financial stability, attitudes towards changes and continuous improvement, references, and collaborative ability (Eriksson, 2008). In addition, the construction clients need to recognize the positive and sustained contribution from contributors in the project rather than distributing the risk by contractual arrangement.

Characteristics of relations in construction

Construction is a project-based industry, resulting in a narrow perspective both in time and scope (Dubois and Gadde, 2002). Definition of projects comes in different shapes. The most common descriptions contain three factors, however. A project is regarded as a temporary event with limited resources and time and has a defined purpose (Engwall, 1995). This is achieved by coordination and steering allocated resources. According to Meredith and Mantel (2006) a project can be seen as a *"Temporary endeavour undertaken to create a unique product or service"*. They add some more factors, such as the project's importance and uniqueness. Turner (1992) describes a project as an endeavour in which human, material and financial resources are organised in a novel way; to undertake a unique scope of work of given specification, within constraints of cost and time, so as achieve unitary, beneficial change, through the delivery of quantified and qualitative objectives. The definitions suggest three key targets of the project, i.e. time, cost and quality, to be in focus when undertaking the project. It also highlights the importance of efficient organisation of available resources in order to achieve a good final result. However, Engwall (1995) argues that a project is not determined by the content, but rather by its form. It is the label "project" that makes the mission unique, not the opposite (Aulakh and Gencturk, 2000, Dubois and Gadde, 2002).

The culture of the project team comprises different contracting parties in the project and also includes company-wide interdepartmental members (Mackay, 1993). The attitudes are also dominated by short-term financial considerations, reflected in uncooperative and suspicious relationships (Shammas-Toma et al., 1998). Even if two exactly similar buildings are produced in different places, at different times and by different organisations, the construction process may be a unique process (Kadefors, 1997). This kind of project also becomes a venue for different experiences, interests, norms and ways of doing things; it becomes a stage for different organisation processes (Sahlin-Andersson, 1989). The process is complex and the clients tend to interact with multiple actors during the process (Winch, 2001). Throughout the construction process, from a client's point of view, the main transfer consists of information in the "project" (to those that are in direct contact with the client). The other transfer of information is the "supply chain", where the actors fulfil their responsibilities to the client (through in-house deployment or by subcontracting). The asymmetrical distribution of information among the construction supplier, the contractor, and the client may nevertheless place the client in a vulnerable situation in which it is difficult to sanction opportunistic behaviour from the contractor's side. The transfer of information therefore becomes critical in order to overcome the lack of diffusion of the client's needs and the desired outcome of the

construction process. Satisfaction at the construction stage is linked closely to the degree of control and supervision by the client themselves (Love et al., 1998), since the project organisation consists essentially of complex communication processes (March, 1998).

Management of relations in construction projects

Previous studies by Vennström (2008) and Vennström and Eriksson (2010) shows that attitudinal barriers (adversarial attitudes, lack of ethics and morality, focus on projects instead of processes, and a short-term focus) were perceived as being more critical by clients using external project management. Thus, the strategy by which the clients choose to manage the process, through their own employees or through consultants, can affect the outcome of the process.

The predicament with both an external commissioner (i.e. Project manager) and an external contributor (i.e. contractor, subcontractor and supplier) lies in the formulation of the project mission and the internal efficiency of a project (Engwall, 1995, Aulakh and Gencturk, 2000). Winch (1998) argue that traditional project management, originating from relations within organisations, do not regard the relation between firms. This influence, Winch (2001) further argue, both vertical (driven by uncertainty and post contract asset) and horizontal (driven by employment relations) governance of the construction process. According to Eriksson (2007), the transaction characteristics, high asset specificity and uncertainty coupled with long duration require low focus on price. This should lead to a lower focus on price (with output control) and a higher focus on trust and authority regarding the governance of the construction process. This can be especially problematic since client requirements “are frequently tacit” in nature and can “only” be understood through a prolonged process of socialisation (Green et al., 2004). Tsoukas (1996) argues that there is a paradox between the fact that participants in construction industry activities, especially on the site, still rely very much on human labour and the industry's engineering attitude to management that gives preference to top-down technocratic systems and neglect the distributed character of the firm's knowledge, its human resources. Organisations, to which the actors in the construction process belong to, have different material/human resources and different values/norms and it is the organisation that the actor belongs to that creates the limits for how they think and proceed in the construction process. This influences the end result of the construction process (Ericsson and Johansson, 1994, Josephson, 1994), since members of a temporary organisation tend to found their acting on their mother organisation’s beliefs.

Evidently, in order to achieve expected outcome of the construction process the construction client should put more emphasis on governance of the construction project than on the actual contracting arrangement.

EMPIRICAL STUDY

This section describes the empirical evidence conducted with clients that are involved in pilot projects financed by the Forum for Building Costs (The National Board of Housing, Building and Planning). The Forum for Building Cost was formed as a reaction to reports regarding the situation in the construction sector (Egan, 1998, Ericsson et al., 2002, Yngvesson et al., 2000). The objectives of the Forum for Building Costs are to develop tools for evaluating construction projects, transfer knowledge and stimulate further education, and analyse the land pricing and rate system used by municipalities. From the 1st of January 2002 the Government has allocated 20 million SEK per year to the Forum for support of suitable pilot projects that, in innovative ways, will reduce construction costs in rental housing while at the

same time promoting ecological sustainability. The pilot projects financed by the forum are published on the forums website as “best practice”. Each of the completed pilot projects has published a report. As a part of the empirical study, the report on each of the projects involved in this study has been examined.

The projects are also similar in that sense that they all are concerning multistory blocks of flats for rental. After the identification of the involved projects, an introductory letter was sent out in which the contact persons (the contact persons that were displayed on the Building Cost Forums website) were asked for participation. The next step was a personal call to all respondents to confirm their participation. The interviews were recorded and the researcher used the recordings to compare the notes taken during the meetings. The questions can be divided into four main areas; focus in the projects, how the respondents carry out the projects and how they organized the projects. The fourth area discusses the findings from in the written reports.

Empirical evidence

In Table 1 the main characteristics of the empirical findings is presented. The results of the interviews are further discussed in mainly four different areas presented above. There is a predominance of development of the construction process, tendering procedures and procurement methods in the sample; just a few projects had a clear technical focus. There is also a variety regarding the described focuses in the project, from highly divided contracts to partnering. This may be an indication that the main are of improvement of the construction sector is on the development of the management process.

Table 1: Main characteristics of the empirical findings.

Type of organisation and project/ Purpose	Type of project and form of contract	Identified success factors from interviews	Success factors described in written reports
Municipality: Development project, High-rise wood Construction	Multi store dwelling: Design and build contract. Main supplier involved	Control over the process. Clients' responsibility to manage the development. Client needs to be active and make demands. Involve the building management in the process. Involve material suppliers in the process, not always trust the consultants. Customer focus. Involve the right persons in the process	Partial congruence with respondents' experience, no description of importance or involving building maintenance and discussion of finding the right person. The written reports focus on discussions about different technical solutions.
Private: Project manual for construction management with technical platform	Multi store dwelling: Divided contract	Client needs to be active. Customer focus, get the right balance between quality and cost. Clients need to consider production aspects. Involve the right persons in the process. Creative process during development phase (Workshop)	Medium congruence with respondents' experience. The report describes briefly the process. Mainly technical development in the written report.
Municipality: Knowledge transfer, implementing change	Multi store dwelling: Design and build contract. Cooperation	Client is active and influences the other actors. Gets the craftsmanship engaged. Clients need to consider production aspects. Cooperation between actors. Find the right persons	High congruence with respondents' experience. The report describes experience from the project. Focus on industrialised construction changed towards competence for the clients. Difficulties with different sub processes well described.
Municipality: Minimise waste in construction	Multi store dwelling: Design, bid and build contract, Partnering	Same expectations in the project organisation. Important that contractors are eager to find waste, understand the purpose. Important getting the own organisation on the bandwagon. Client must be active. Find the right balance between cost/quality.	High congruence with respondents' experience. The report describes the end result, only partly the ongoing process. Important to employ the right people.
Municipality: Development and evaluation performance of buildings	Multi store dwelling: Design, construct and maintenance contract.	The project is abandoned, no building permit Important to get one's own org. to understand the uniqueness of the project. Find the right persons to involve.	Describes mostly what is supposed to happen, not how it should be achieved. Partly because the project has stranded. Low congruence with respondents' experience.
Municipality: Evaluation of Client-led design and bid contracts	Multi store dwelling: Divided design and build contracts	Client must have the initiative by knowing what they want. Important to invest a lot of time and energy. Informed client is important	Describing procurement demands, generic descriptions. Low congruence with the client's experience.
Municipality: Competitive tendering procedure	Multi store dwelling: Divided contracts	Client must be active, take the initiatives, demands a lot of time and energy. Find the right persons to involve.	Low congruence with the client's experience. Describes the process from idea to procurement. Emphasis on the importance of clarity, clear demands.
Private: Evaluation of planning and tendering process	Multi store dwelling: Divided contracts	Commitment important. Visible client (also on the construction site). Prolonged relation with the constructor. Tailored land use plan after the buildings (successive calculation to get the right balance between cost and quality) flexible municipality. Knowledge of user demands from experience	High congruence with client's experience. The report deals with the process and technical aspects. Rich description of success factors
Municipality: Cooperation among actors	Multi store dwelling: Design and build contract cooperation	Important to get the own organisation involved in the process. Important not to create a bureaucracy organisation. Client must be active in the process and promote cooperation among involved actors.	partly congruent with the client's experience. More focus on WHAT they have done, than how. Mix of technical descriptions and description of the process.

Management of projects

The different projects showed similarities despite having different purposes. The aims of the projects (which were described in the reports) dealt with development of different forms of performance models, technical development and process development. Regardless of the different intentions, one similarity among the respondents was that they all needed more experience of how to handle the construction process, in particular of handling large new constructions. More specifically, the respondents thought that they wanted "better control of the process". One significant word that appeared during the interviews was "certainty". The respondents wanted to be confident with the end result of the construction process, which they referred to as a balance between cost and quality in the projects, quality that was based on user demands. Another significant similarity was that they were not interested in building "cheep" products. They instead referred to products "worth their price" (By products "worth their price" they referred to a balance among cost, level of quality, location and level of rent).

An important issue in many of the studied projects was the question of involving building management early in the process. That was an important experience, according to the respondents, in order to achieve a successful process. The success of involving building management issues in the process differed among the projects. The respondents with large organisations experienced more effort in involving their own organisation in the idea of the pilot projects.

One question dealt with the issue of the ideas behind the pilot projects, and the origins of the ideas. Except for two of the projects, the ideas were not directly new ideas to the respondents. They had already dealt with most of the issues in some way. According to the respondents, the benefit of transferring the ideas to the pilot projects was that it gave them an opportunity to develop the projects in a more structured way.

Experience of success factors

There is a similarity among the success factors in almost all the projects: the clients' commitment and the importance of finding the right people to align to the process. All the respondents re-emphasized the importance of being an active client, by a more personal commitment and by being well informed. Several of the respondents also referred to the "feeling of control" of the construction process. They wanted to feel secure that the product was right and that the construction process was conducted in the right way. The issue of finding the right people to involve in the process relates to the clients' desire to cooperate in the projects. They had a similar picture of the importance of the right individual attributes of the participants to handle cooperation. Here they referred to the skill for cooperation as an important issue, almost as important as the construction experience.

Organisation of the projects

The purpose of most of the pilot projects was to test/develop different modes of working. The span was from highly divided contracts to extremely governed design and building contracts, and some even added partnering. Despite the different objectives of the projects in this study, they all shared a similar willingness among the participants to develop new ways to carry out a construction process. A common feature of the projects was the involvement of the participants early in the process. By tradition there are many "water proof bulkheads" in the process, consultants prescribe solutions, the contractor calculates and sign the contract and the project is defined. Later in the process the clients discover that things can be done differently, which result in extra cost. The organisation of the projects varied, however, from large groupings with many "new" actors involved (actors that normally not are involved in the

decision process) to more traditional groupings. The participation of "new" actors was affected by the type of project. The projects that had a more technical focus had a larger participation of "new" actors. No corresponding tendency was however found in most of the projects dealing with development of the process. On the question of the contractual arrangement, the use of standard contract, the respondents referred to them as a "security" if any conflicts would arise during the project time.

Note on documentation of project success

The written reports that are published have various similarities with the respondents' experience from the pilot project. As seen in the comparison between the experiences from the project and what was expressed in the reports there are not always similar. In the reports there are extensive descriptions of the technical aspects of the projects, of different technical solutions. The descriptions of "how" they achieved the results in the pilot projects are in many cases summary. One exception are the reports where researcher where involved in the project. The variations in the reports are, of course, dependent on the aims of the projects. The projects with a high technical focus (e.g. development of technical solutions) have more descriptions of the solutions. However, the written reports on the projects with higher attention on the development of the process also have more descriptions of achieved technical solutions and the aspects of learning are not considered in the same extent.

CONCLUSIONS

The purpose of this paper is to investigate the impact of different forms of contracts impact on the project outcome, through a multiple case study of construction projects. This study does not try to define exactly what a successful project is. Since the projects are displayed publicly as "best practise" for other to be inspired of, the assumption in this study is that the investigated projects are to be regarded as successful. The respondents also referred to the question on project success that the project results were satisfying on their behalf and the similar view can be found in the written reports. The exception is the projects that stranded due to circumstances outside the clients range. The findings show that there are several similarities in the investigated projects. First it can be said that the type of project result were similar in this study, multi store dwellings for rental. Secondly, the different construction clients had the same "picture of the problem", that is, they were all very keen on delivering the right product to the market, with the right balance between cost and quality. The affect, though, of a specific form of contracts on the project success could not be distinguished on the in this study. This finding indicates that time and cost needs to be seen in the light of business achievement for the project in order to measure the project success.

Thirdly, the construction clients put more effort on involvement from their side in the studied project. They stressed the importance of involving their own organisation, such as maintenance staff, as well as other actors normally partly involved in the construction process. The performed projects focused on cooperation, with participation from the actors in the construction process (such as contractors, suppliers etc.) regardless chosen form of contract. Significant is that the focus in the project was on individuals involved in the project rather than the specific form of contract. That is, the management of the relations in the projects is of great importance for project success. Thus, the standard contracts are of course important if any conflicts arise, but of more importance is to create a project environment that supports the collaboration between the project participants.

One other similarity among the pilot projects was that the construction clients put more effort into the early stage of the construction process on defining prerequisites for the final product. Their view was that the early stage is the part of the construction process where the efforts are well spent. The result stresses the importance of creating a project environment with focus on the project members' cooperation towards the same goal rather than which form of contract to use. This brings to attention the importance of putting emphasis on motivating the project participants rather than just getting the job done. In addition, construction client's need to recognize the positive and sustained contribution they have to make if successful project results are to be the norm rather than the exception.

However, there are certainly more aspects of project success that are not covered in this study. For example, this study does not cover whether the contractors and suppliers agree on the presented outcome of the projects. Another issue that this study not covers is the well known "Hawthorne effect". That is, theses studied projects were publicly officiated since some of the financing came from Forum for Building Costs. Furthermore, the projects were expected to deliver a report describing the result and findings from the projects to the financiers. One interesting matter to cover in future studies is if the success of these, or any, projects is depending on the motivational effect of the interest being shown in the project participants from the public or other stakeholders.

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PROMOTING GREATER PUBLIC PARTICIPATION IN DECISION MAKING FOR INFRASTRUCTURE DEVELOPMENT PROJECTS: BUILDING SOCIAL CAPITAL THROUGH YOUTH ENGAGEMENT

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When a substantial amount of public money is allocated to an infrastructure project, are societal needs adequately addressed to solve or alleviate the problems as originally intended? Opposition against infrastructure projects and protests at construction sites are not uncommon, yet many governments in advanced democratic societies put a strong emphasis on public engagement and devote significant resources toward these programs. One of the more outspoken groups often appearing in these protests are youths in their late teens and 20's. How can young people be engaged more effectively so that a culture of greater public participation in decision making for infrastructure development projects can be nurtured? This paper aims to investigate and discuss: i) the level of understanding young people have about policies, products and technologies related to infrastructure development that can provide greater societal and environmental benefits (and their willingness to pay for them); ii) how to increase youth involvement in public engagement events for infrastructure projects; and iii) how to extract higher quality feedback and ideas from young people through partnerships with various networks within society (thus building social capital) to help decision-makers better incorporate them into the planning and design of infrastructures. A youth engagement event was organized in collaboration with a non-government organization and the theme of the event was on Hong Kong's policies and strategies on climate change, with an emphasis on reducing greenhouse gas emissions in buildings and transportation. A two-stage questionnaire was conducted with the participants on their knowledge on environmental issues and level of involvement in public engagement events for infrastructure development projects. Findings and observations from this event will be presented in this paper. The values and roles of networks within society to help promote greater public involvement in the decision making process for infrastructure development projects will also be discussed.

KEYWORDS: public engagement, social capital, youth empowerment, public participation

INTRODUCTION

Public spending on infrastructure projects is intended to enhance the competitiveness of a city and improve the quality of life for its residents. Yet, cases of protests and demonstrations at construction sites of infrastructure projects are abundant. In many instances young people in their late teens to early 20's, arguably one of the more outspoken groups in society, are often seen taking part in protests for infrastructure projects. Although these demonstrations are not always exclusively initiated by young people, it is certainly worth focusing on this particular group and investigate deeper into this phenomenon as doing so can help governments and policy makers enhance public engagement practices in the long term by nurturing a culture of greater public participation in decision-making for infrastructure projects. It is particularly important for a city like Hong Kong (where public engagement is still at an infancy stage compared with places like Scandinavia) to promote greater public involvement in a place that lacks such participation from members of the community. Furthermore, better understanding of how to more effectively engage the public can help mitigate project delays, improve mutual understanding amongst different stakeholders to reduce friction embedded in communities when conflicts of interests arise, and ultimately contribute to a more harmonious society.

Providing the necessary information to empower citizens with sufficient knowledge about an infrastructure project can improve the quality of public feedback, which in turn can become more useful for decision-makers. Public participation involving forums, exhibitions, surveys, etc., is often part of a phase within the planning process instead of a continuous effort (Sager, 1981). However, without constant connection and dialogue with the public, underlying issues affecting society may not be adequately addressed. This paper will discuss how the public engagement process for infrastructure and development projects can be enhanced through building social capital; utilization and mobilization of networks within society to reach out to a broader audience who would otherwise not participate in public engagement events to offer their views; and the development and nurturing of a culture of greater public participation for the upcoming generation through better collaboration and cooperation between the government and various networks within society such as NGOs and NPOs. Findings from a youth engagement event on Hong Kong's policies and strategies on climate change (organized in collaboration with the non-government organization, Envision Hong Kong, and the Centre of Development and Resources for Students at the University of Hong Kong) will also be presented.

PUBLIC ENGAGEMENT IN HONG KONG

The Hong Kong government's desire to seek greater public input for its policy development was reflected in the 2010/11 Policy Address by the Chief Executive of Hong Kong, Donald Tsang. Regarding urban renewal, he stated that, "urban regeneration is a key topic straddling a number of policy areas, including planning, land, housing, heritage conservation and social development", and the new urban renewal strategy "is based on the core values of people orientation, public engagement and respect for local characteristics" (*HKSAR Policy Address, 2010/11*). Efforts to solicit public opinions on infrastructure and development projects in Hong Kong could be seen from examples like the New Central Harbourfront, West Kowloon Cultural District and Kai Tak (old airport) Re-development projects, where public engagement events were conducted for each of those projects in 2007, 2009 and 2010, respectively. Even so, these efforts would yield minimal results if a culture for greater public

participation in engagement events is not being developed and nurtured. In many cases, existing public engagement activities in Hong Kong are primarily attended by individuals or groups with specific intentions/interests or are directly affected by a project, while the broader public who may have certain views or ideas may not chose to express their opinions at these engagement events (*Wong et al, 2009*).

Two highly publicized incidents in Hong Kong were the Queen's Pier relocation project and the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Railway Link (XRL). The Queen's Pier relocation project involved the reconstruction of the pier on a piece of reclaimed land along the waterfront area as part of the Central Reclamation project. The old pier was considered to be symbolic and rich in history (of the British colonial era in Hong Kong), dating back to 1925 and served as the arrival point for many of Hong Kong's governors prior to the 1997 handover back to Mainland China. There were severe opposition from various organizations including the Conservancy Association, Society for Protection of the Harbour and the Hong Kong Institute of Architects (*SCMP, March 2007*). In the hours leading up to the closing of the old pier, students rallied at the demolition site and went on a hunger strike in a last attempt to save the pier (*The Standard, July 2007)*. In the wake of these protests, dismantling of the old pier had to be postponed and resulted in plenty of negative attention to the project.

The Hong Kong section of the XRL project, intended to connect Hong Kong to the railway network in the Guangdong Province, was another contentious project. High costs (nearly HKD$70 billion), relocation of residents from a village in the path of the proposed railway, and the potential noise pollution in other districts along the railway route were amongst the reasons of opposition. A group of young people, known as the Post 80s Anti-Express Railway Group (Post 80s referring those who were born after 1980) came to the defense of the villagers whose homes were to be destroyed to make way for the new railway. These youngsters held demonstrations both at the legislative council and at the village when the bulldozers arrived (*SCMP, January 2010*).

The demonstrations at both projects received significant attention in the local media and became hot discussion topics around the city. Of course, these two projects are more severe examples of what can go wrong when there is lack of communication between various stakeholders (including the public), and not all infrastructure projects would draw such intense controversies, but these examples do raise some interesting points. How can we promote greater participation amongst young people in public engagement events for infrastructure projects so that a culture of more active public involvement in the decision-making process can be developed? What existing resources within communities can be utilized or mobilized to achieve this? The building of social capital as a possible approach for reaching out to a larger audience to improve the engagement process and help nurture a culture of increased public participation for decision-making in infrastructure development will be discussed later in this paper.

PUBLIC ENGAGEMENT IN SCANDINAVIA

While Hong Kong is still experiencing some growing pains in the development of public engagement processes, Scandinavian countries are relatively more mature in this area. The Swedish government commissioned a two-year service charter pilot scheme in 2001 intended to: i) promote better transfer of public services information to the public; ii) establish

continuous, systematic dialogue with citizens and setting up internal procedures to handle complaints; and iii) integrate comments into government agendas. The pilot scheme was well-received by the public and the experience was documented to provide detailed lessons for employing such schemes and how to improve service dialogues with citizens (OECD, 2005).

From 1997 to 2001, the Ministry of Labour and Government Administration in Norway commissioned a study to explore and evaluate new methods and combination of methods for promoting public participation, including surveys, contact meetings/conferences, non-specialist/voluntary organization committees, and electronic participation. The results showed that the ministries of health, social affairs, justice, and foreign affairs made use of more diverse engagement methods compared with other ministries with contact meetings, conferences and consultative panels accounting for approximately two-thirds of the methods. Electronic forms of engagement were still in its early stages of development and participation levels were not particularly high but were beginning to take shape with the Ministry of Finance developing interactive portals for its website, while increasingly more information was distributed to the press and other organizations electronically by the Ministry of Foreign Affairs (OECD, 2005).

In Denmark, public consultation played an important part of the approval process for two major offshore wind power demonstration projects in Horns Rev and Nysted in 1999. The Danish Energy Authority is responsible for granting permission for wind energy exploitation and act as the coordination body for managing the diverse interests of relevant stakeholders. As part of the approval process, public consultation was required prior to: i) conducting preliminary studies/surveying; and (ii) obtaining the build permit. Environmental Impact Assessment (EIA) was required before each public consultation stage was allowed to take place. Analyses on wind, current, seabed conditions, archeological remains, coastal safety, alternative locations, environmental impact mitigation measures were some of the elements required for the EIA. All of this information was then used in the public consultation material and the public was given a minimum of eight weeks to submit their comments and feedback (Danish Energy Authority, 2006). This is in line with the view of Sager (2001) that EIA can serve as a medium for debate in democratic practice and that such a medium must consist of diverse information with forums being a meeting point where often conflicting views are exchanged (Sager, 2001).

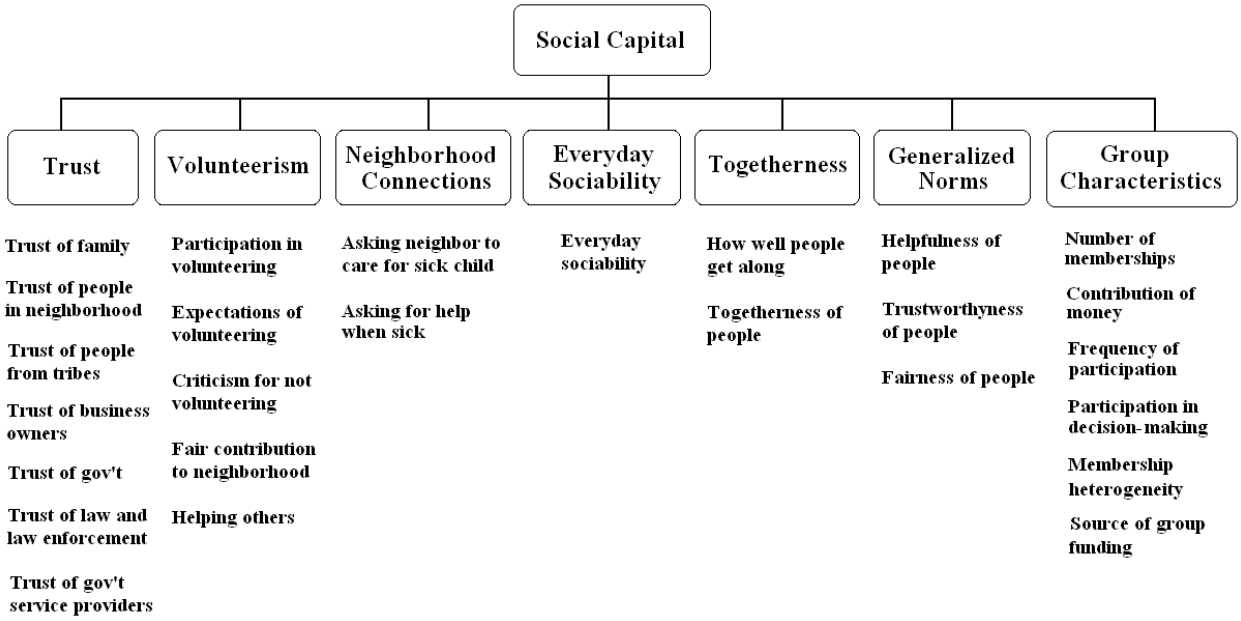
One important observation to note from these cases is that many of these initiatives often involve multiple government departments. The significance of having large-scale initiatives like these, which involve inter-departmental collaboration, is that it enables all the ministries to observe the techniques used by other ministries and share their experiences in engaging the public. Furthermore, by having programs involving or initiated by the central government, a culture of promoting greater public participation in developing public policies can be incubated and expanded across the government.

SOCIAL CAPITAL AND VOLUNTEERING

In general, social capital is considered to be the value of the network relations within society although there are many definitions and interpretations of social capital, and as noted by Robinson et al. (2002), there is no set definition of social capital so the specific definition selected for a particular study depends on the discipline and level of investigation. Pennar

(1997, p.154) referred to social capital as "the web of social relationships that influences individual behavior and thereby affects economic growth", while Thomas (1996) used the term social capital as "those voluntary means and processes developed within civil society which promotes development for the collective whole" (Thomas, 1996, p. 11). Nahapiet and Ghoshal (1998) suggested that social capital "comprises both the network and the assets that may be mobilized through that network". Furthermore, they proposed that intellectual capital is embedded within social capital and through effective combination and exchange of this intellectual capital, new additional intellectual capital can be created. In the context of this paper, the focus will be on the role of social capital in providing additional channels for more effective engagement. Narayan and Cassidy (2001) outlined the various dimensions of social capital as shown in Figure 1. Participation in decision making, building trust in government and volunteering will be the dimensions being focused on in this paper.

Figure 1: Dimensions of Social Capital (Narayan and Cassidy, 2001)



Based on a research study conducted in Hong Kong by Chan E. and Chan J. in 2009, the percentage of volunteers classified as professionals and managers increased to 49.4% in 2009, compared to 33.1% in 2001 from a similar study. This is a welcoming sign as it shows that members of society with expertise (and presumably higher education levels) are taking part in volunteering work to give back to society. This trend of increasing participation in volunteering work from professionals presents an opportunity of enhancing public engagement through greater knowledge transfer from expert to public. Through this process, more intellectual capital from society, which is embedded within social capital as suggested by Nahapiet and Ghoshal, can be extracted from the public, thus enhancing the quality of the feedback.

CONDUCTING YOUTH ENGAGEMENT EVENT ON CLIMATE CHANGE AND SOCIAL AND ENVIRONMENTAL AWARENESS

To understand how to engage youth in a more effective manner, an engagement event was planned and facilitated in collaboration with the NGO Envision Hong Kong and the Centre of

Development and Resources for Students (CEDARS) at the University of Hong Kong in early October 2010. A total of 69 participants attended the event, which included young professionals, university and secondary school students. The participants were recruited through the network of Envision Hong Kong to reach out to university and secondary school students and young professionals who volunteer as mentors to these students, as well as via e-mail invitations from CEDARS to students and alumni from the University of Hong Kong. The event was titled "i350 Youth Summit on Climate Change", which holds a dual meaning with "i" representing what individuals can do to combat climate change, and the pronunciation of "i" means "love" in Mandarin. 350 refers to the target of bringing the carbon dioxide level down to 350 parts per million (ppm). The focal point of the group discussion segment at the i350 Youth Summit on Climate Change was the public consultation document on Hong Kong's Climate Change Strategy and Action Agenda released by the Environmental Protection Department (EPD) of the Hong Kong government in September 2010 (the public consultation document itself was based on a consultancy study commissioned by the EPD in 2008). The proposed target was aimed at reducing Hong Kong's carbon intensity by 50-60% in 2020 compared with 2005 levels (this would equate to 0.012-0.015kg of carbon dioxide equivalent per HK dollar GDP in 2020 versus 0.029kg in 2005). It was highlighted that the three major sources of green house gas emissions in Hong Kong comes from: i) electricity generation (67%); ii) transportation (18%); and iii) waste treatment (5%). Since energy usage in buildings account for approximately 90% of all energy consumption in Hong Kong, this means that energy usage in buildings contributes over 60% of all GHG emissions in the city (EPD, 2010). In response to these figures, a set of proposed strategies and action plans to focus on the above areas were derived and some of the key strategies and action plans are highlighted in Table 1.

Table 1: Highlights of Proposed Strategies and Action Plans. Source: Environmental Protection Department, Hong Kong SAR Government

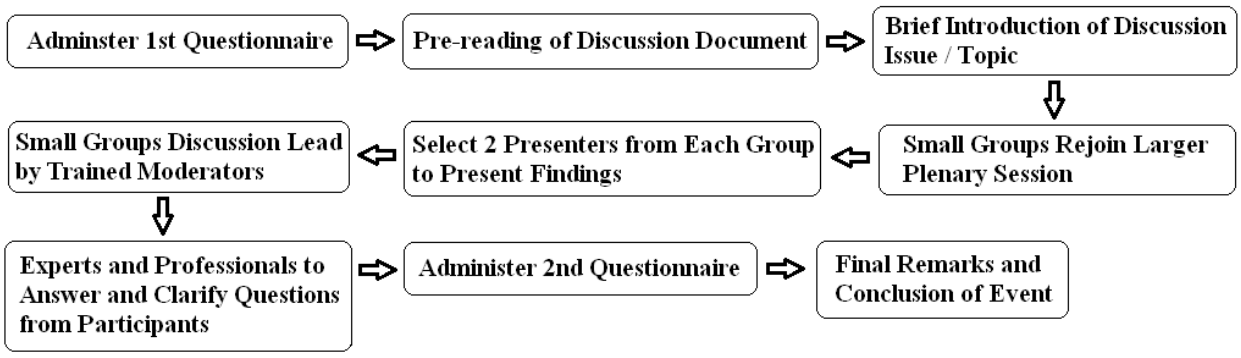
Highlights of Strategies and Action Plans from EPD
Focus: Buildings and Electricity Consumption • Expanding the scope and tightening the requirements of the Building Energy Codes, such that by 2020 major electrical equipments in all new commercial buildings will be up to 50% more energy efficient as compared with 2005 building stock; • Expanding the use of district cooling or water-cooled air conditioning, such that by 2020 up to 20% of all commercial buildings will be up to 50% better in refrigeration performance compared with buildings using regular air conditioners; • Reducing energy demand in new buildings by various means such as tightening the overall thermal transfer value (OTTV) standards and promoting wider adoption of green roofing, such that by 2020 all new commercial buildings will reduce their energy demand by up to 50% as compared with new buildings in 2005; • Improving energy efficiency in commercial buildings through good housekeeping, information technology products and intelligent building environmental management system, such that by 2020, 25% of existing commercial buildings can be 15% more energy efficient compared with 2005; and • Expanding the scope and tightening the energy efficient electrical appliance standards for domestic use, such that by 2020 all appliances sold in the market will be 25% more energy efficient compared with 2005.
Focus: Transportation • The Government will continue to invest in the mass transportation systems and improve public transport to maintain a low carbon contribution from this sector. Furthermore, access to public transportation will be stepped up, and pedestrian areas and covered walkways, etc. will be set up to reduce transport needs. • The Consultants envisage that advancement of technology can possibly offer further emission reduction opportunities in the following ways - (a) wider use of motor vehicles running on alternative fuel such that 30% of private cars, 15% of buses and goods vehicles are hybrid and EVs or other vehicles with similar performance by 2020; and (b) implementation of importers' average fleet efficiency standards such that new vehicles will be 20% more energy efficient than the 2005 market average.

Focus: Waste Treatment

- The substantial amount of waste generated as a result of urban life in Hong Kong can be used for power generation. The Consultants recommend that the construction and operation of waste-to-energy facilities and better utilization of landfill gas as an energy source before 2020 can help reduce GHG emissions. The specific measures are as follows - (a) development and full operation of one integrated waste management facility (IWMF), two organic waste treatment facilities (OWTFs), and one sludge treatment facility; and (b) full utilisation of the recovered landfill gas and gas generated from waste water treatment.
- The Government plans to develop IWMF in phases by adopting advanced incineration with energy recovery as the core waste treatment technology. The first phase will have a daily treatment capacity of 3 000 tonnes of waste and can supply about 480 million kilowatt-hours (kWh) of surplus electricity to the power grid per year, which is sufficient for use by over 100 000 households. This is equivalent to 440 000 tonnes less GHG emissions. The detailed engineering and the Environmental Impact Assessment (EIA) studies for the IWMF are being conducted to ascertain the suitability of two potential sites. We expect to consult the public at a later stage on the first phase of IWMF for commissioning in mid 2010s.
- The government plans to develop OWTFs in two phases by 2020. On completion, the facilities will have a total daily treatment capacity of 400 to 500 tonnes of organic waste. The biogas generated in the treatment process can also be used for power generation. It is estimated that for the two phases of OWTF, about 28 million kWh of surplus electricity can be supplied to the power grid per year, which is adequate for use by 6 000 households and expected to reduce GHG emissions by about 50 000 tonnes per year.
- The government will also continue to construct and operate a sludge treatment facility, and strive to achieve full utilisation of the recovered biogas at our landfills and our wastewater treatment facilities.

While the EPD public consultation exercise attempted to reach out to the broader public through some straight forward consultation questions and needed to strike a balance between including sufficient technical information and keeping the content comprehensible to the general public, it was still difficult to convince the average citizen to go through the 60-page document and provide comments. Taking advantage of this public consultation exercise and using the public consultation document from EPD as a basis, a structured discussion session was designed as illustrated in Figure 2.

Figure 2: Flow of Structured Discussion at the i350 Youth Summit on Climate Change



A two-stage questionnaire survey specifically designed for this event was administered; one before the event commenced (prior to the participants' active participation in discussing about the consultation points) and one after the event concluded. The purpose of the two-stage questionnaire is to find out if the participants feel differently (or more strongly) about certain issues or even change their minds after receiving more information and discussing in detail about the topics and issues being consulted on. Some of the key questions from the two-stage questionnaires are listed in Table 3.

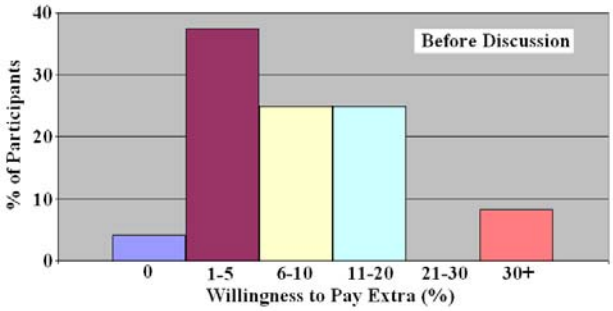
Table 3: Key Questions on Two-stage Questionnaire

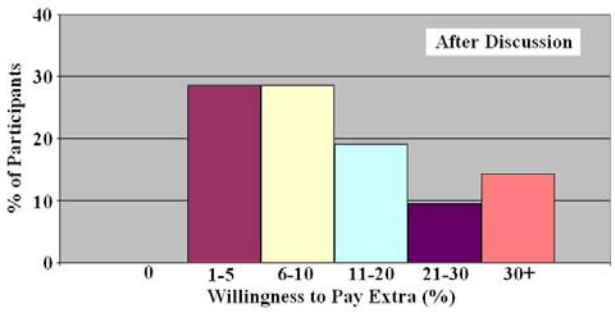
Key Questions on Two-stage Questionnaires
Do you believe you can play a role in development projects by contributing your ideas at this stage of your life?
Are you aware of any public consultation/engagement events for development projects or policies in Hong Kong (such as Kai Tak Development, West Kowloon Cultural District, Hong Kong's Climate Change Strategy)?
Have you participated in any public consultation/engagement events for development projects or policies? If so, which ones?
How do you think the government can better engage you to share your ideas (social network websites, school visits by government representatives, written comments, and/or consultation forums)?
Do you feel that your needs have been adequately addressed in infrastructure projects in the following areas (in terms of accessibility, location, resources, features, equipment, etc.): Transportation (public transport, roads, bridges, airport, etc.); Recreation (sports venues, parks, etc.); Education (schools, libraries, etc.); Other
How much more are you willing to pay extra for: Using electricity generated from renewable energy sources such as solar or wind; Using more environmentally friendly construction materials for your home; Using more environmentally friendly transportation technologies (such as electric/hydrogen-powered buses vs. diesel-powered buses; or more energy-efficient trains); The government using more environmentally friendly construction materials or methods for public infrastructures or buildings (i.e. how much more taxes would you be willing to pay?)

FINDINGS FROM I350 YOUTH SUMMIT ON CLIMATE CHANGE

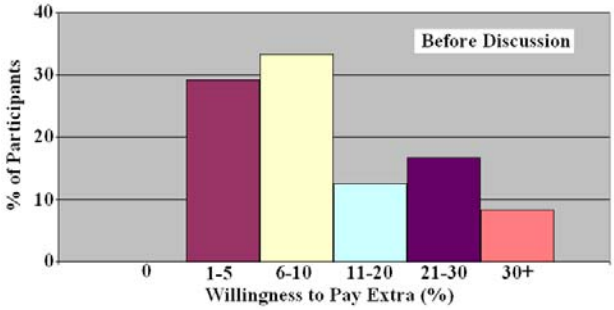
A total of 29 surveys were collected and the results are discussed in this section. The career status distribution of participants was: 48.3% secondary school students; 24.1% young professionals; 24.1% university students; and 3.4% established professionals. The gender distribution was nearly even at 51.9% male and 48.1% female. The majority of the respondents (89.3%) believed that they can play a role in infrastructure development projects in Hong Kong by contributing their ideas at the current stage of their lives. However, there was a troubling sign when it came to participation in public engagement events for actual projects. Although 65.5% of respondents were aware of public engagement events for infrastructure development projects or policies in Hong Kong, only 13.8% actually participated in those events. Certainly, more has to be done to properly engage and attract youth to take part in these events. The upside was that after the participants' involvement in the discussion session, 95% of them expressed that they would consider participating in future public engagement events for infrastructure development projects or policies. This is a promising sign as it shows that these young people have the desire to make a contribution and are willing to participate, provided that they are properly engaged. As expected, social network websites (such as Facebook and Twitter) were considered the most effective channels for the government to engage youth (62%), while other traditional forms of engagement like school visits by government representatives, consultation forums and written comments lagged behind (48.3%, 44.8% and 37.9%, respectively). Around three quarters of the participants felt that their needs have been adequately addressed in transportation and recreation infrastructures, while the number was slightly lower at 69% for education facilities. Figures 3 to 10 illustrate the willingness of participants (before and after discussion) to pay extra for: i) electricity generated from renewable energy sources such as solar or wind; ii) more environmentally friendly construction materials for their homes; iii) more environmentally friendly transportation technologies; and iv) paying higher taxes for the government to use more environmentally friendly construction materials for public infrastructures or buildings.

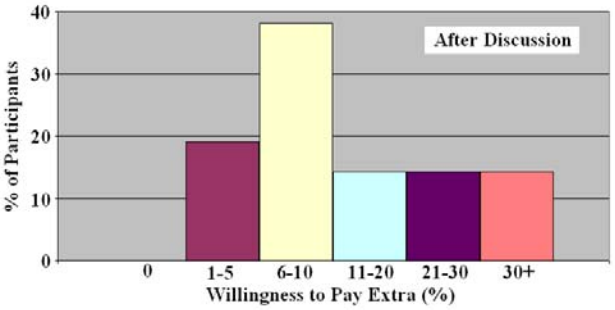
Figures 3 and 4: Willingness to Pay for Renewable Energy



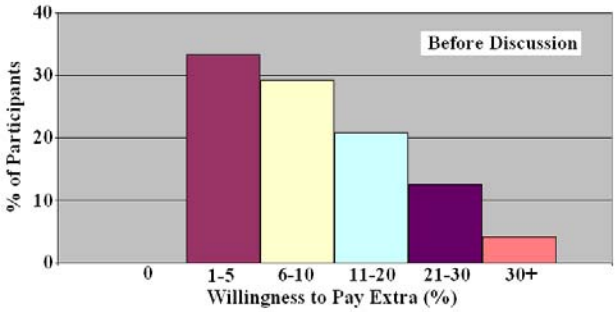


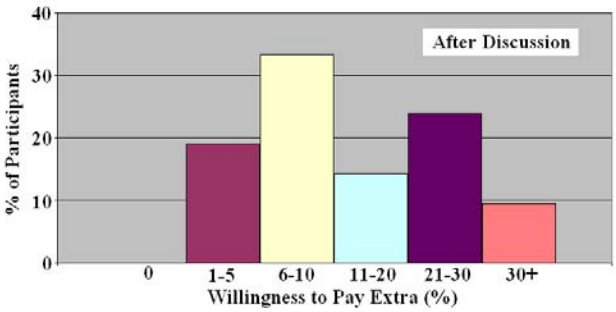
Figures 5 and 6: Willingness to Pay for More Environmentally Friendly Construction Materials



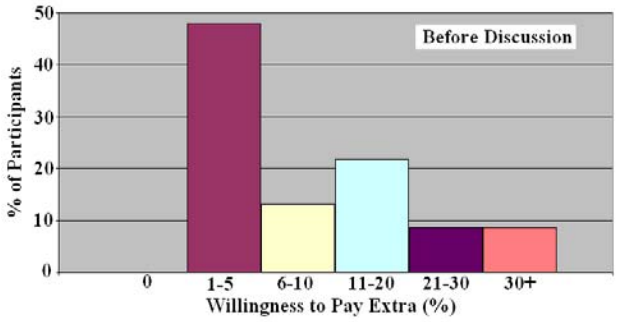


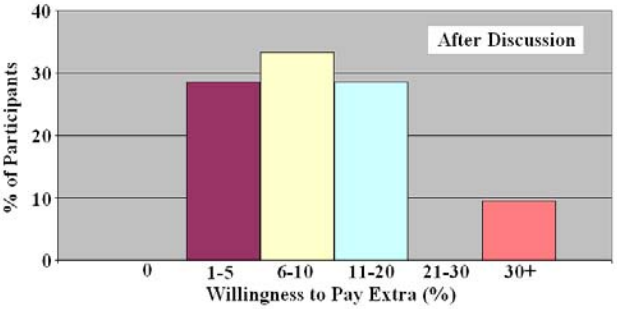
Figures 7 and 8: Willingness to Pay for Environmentally Friendly Transportation





Figures 9 and 10: Willingness to Pay Higher Taxes for the Government to use More Environmentally Friendly Construction Materials for Public Infrastructures or Buildings





In general, there was a shift towards a greater willingness to pay in all categories after the participants had a chance to read through the consultation document and discuss with their peers. The most notable changes were from the 1-5% to 6-10% intervals. Surprisingly, the

biggest difference was the willingness to pay extra for the government to use more environmentally friendly construction materials for public infrastructures and buildings through higher taxes. In this category, approximately 45% of the participants were willing to pay 1-5% extra before the workshop and discussion, and that number went down to just over 25% after the event. At the same time, the percentage of participants who were willing to pay 6-10% extra jumped to over 30% from around 10% prior to the event, and the willingness to pay 11-20% extra went up to over 25% versus just under 20% prior to the event. The implication is that there is a sense amongst young people towards the idea that building a greener city is everyone's responsibility.

The i350 Youth Summit on Climate Change was widely considered a success and valuable experience was gained from this experience. The opinions of participants regarding the EPD's public consultation document were collected and summarized in a report submitted to the Environment Bureau on 10 December 2010. In order to further solidify the findings presented in this paper, additional workshops and engagement events on social and environmental awareness will be planned and conducted in collaboration with Envision Hong Kong and CEDARS, where similar two-stage questionnaires will be administered again to expand on the sample size (although some questions will be adjusted based on the nature of a particular project). Potential themes for future events include the Kai Tak (old airport) redevelopment project and Hong Kong's decision to bid for the 2023 Asian Games (where sports infrastructures and facilities will need to be built or upgraded).

CONCLUSION AND DISCUSSION

Providing sufficient information regarding public activities to citizens, NGO's and industries is an essential part of developing public policies in a democratic society (OPEC, 2005). Conventional, project-based public engagement needs to be complimented by a broader, continuous form of engagement in order to develop a culture of greater public participation. Rather than focusing solely on the relationship and transfer of information between the government and the public, it is proposed in this paper that certain networks and organizations within society can be mobilized to serve as a vehicle for this information transfer and expand communication channels with citizens to reach out to a larger audience.

The i350 Youth Summit on Climate Change brought together young professionals, university and secondary school students to discuss the problem of climate change and the actions and policies needed. This event indicated that partnering with networks within society (in this case an NGO focusing on youth empowerment and the student development centre at the University of Hong Kong) can help engage young people from society, many of whom would have otherwise not participated or responded to public engagement events. By reaching out and empowering the participants with knowledge, tools and a channel for them to share their views, the participants were outspoken and willing to offer their opinions and voice their ideas.

Youth represents a unique group in Hong Kong, growing up in a society that is transitioning towards a more public engagement-based public policy process (compared with the previous generation during the British colonial days prior to the 1997 handover back to China where public consultation or engagement on policy was limited). Certainly there will be growing pains during this transition period as evident from the protests during the Hong Kong section of the XRL and Queen's Pier relocation projects. For the Hong Kong government to

successfully commit to a public engagement-based approach to policy making and setting development goals (as outlined in the Policy Address for 2010-11 and in previous years), it is imperative to proactively engage youth in order to develop and nurture a culture of greater public participation in the decision-making process. Various stakeholders and networks within society such as NGOs, NPOs, construction industry coordination bodies, professional associations and institutions and education institutions can all play a role to help to bridge the knowledge gap between the professionals involved with designing and building the infrastructures and the broader public (for example, recruiting construction industry professionals to serve as volunteers; or reaching out to a particular group in society as in the case of Envision Hong Kong engaging youth for the i350 Youth Summit).

The significance of mobilization and utilization of these networks in society to promote greater public involvement in the decision making process for infrastructure development projects may often be overlooked. Conventional public engagement or consultation events involve government representatives and experts from private consultants explaining the benefits a project would bring to a community. When the private sector joins the government in such promotional work, there is a lack of trust from the public in that financial profits and return on investment remain the priority rather than the value being delivered to the end users (e.g. the public). This is an area where certain NGOs and NPOs can help by building this trust because many NGOs and NPOs are engaged in a variety of social activities and do not solely focus on infrastructure projects. Therefore, their interaction with the general public is much deeper and as noted by Hui F. (2010), these organizations are able to fill in the voids left by government initiatives. Due to the absence of this conflict of interest, certain organizations can help build a stronger trust between the government and the public. Rather than having these NGOs and NPOs approach the government to engage in partnership, the government should be more proactive to work and coordinate with these organizations so as to reach out to a broader audience.

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