

GREEN AND CONSTRUCTION SUPPLY CHAIN MANAGEMENT: THE MALAYSIAN SCENE

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ABSTRACT

Construction industry concerns not only property development but the built-environment as a whole. As the construction industry continues to develop the built environment within the natural environment, stakeholders are accountable to achieve the highest standards of quality, occupational safety and health, and environmental practices. As business operations expand in scope and borders, many successful companies of today are exploring new ways of gaining ground over their competitors in the market. The environmental aspects is considered as one of the key thrusts in the development of the Malaysian construction industry. This paper addresses some issues concerning the applicability of supply chain management in the context of the construction industry, with Malaysia being the backdrop to this research effort. More specifically, this paper will present the results of an initial effort in identifying the awareness level of the key construction industry players, namely the developer/client, contractor, and supplier on the green issue in context of the Construction Supply Chain Management (CSCM). From the results of the study, it was revealed that there were several issues regarding the environment that needs looking at. A discussion based on these findings, which was obtained through a mix of qualitative and quantitative approaches, is also presented. Finally, this paper rounds off the research with a conclusion and some recommendations for future endeavours.

Keywords: construction supply chain management, green supply chain management, Malaysian construction industry

INTRODUCTION

With the advent of globalisation, the level of competitiveness increases drastically with successful companies continue to grow in size and numbers across borders. More and more growing companies are facing greater challenges in trying to conquer a larger share of the market with international companies flood in to compete for the local market. Companies in the industrial sector focuses their strategy not only on their products but they also concentrates on a more holistic approach, in which they focuses on the internal and external processes of their company. Through this, successful companies are not only looking to improve themselves but also their upstream and downstream partners. This Supply Chain Management (SCM) concept has been identified as perhaps the next best approach in gaining competitive advantage.

Manufacturing sector has applied the SCM concept and proven successful in term of improving competitiveness, covering various industries including food, textile and automotive industries. Due to the success of the SCM concept on the manufacturing sector, efforts are being made to explore its promising applicability in other sectors, especially those contributing towards the major economic development of a country such as the construction industry, as the focus of this paper.

Construction Industry Master Plan (CIMP) as released by the Malaysian government, through its construction arm, Construction Industry Development Board (CIDB), details out the strategic approach to accelerate the development of the construction industry in Malaysia. The implementation of SCM in the Malaysian construction industry is one of the key thrusts of the CIMP, where all the key players along the construction supply chain should continuously improve all the processes along the supply chain starting from the suppliers, all the way to the client.

SCM covers many aspects of management but this paper focuses on the environmental aspects or Green Supply Chain Management (GrSCM). When discussing about the construction industry, the environmental issue will come as one of the key issue that needs to be addressed by the players of the industry. This issue covers waste management, complying with the standards set by the local and global authorities and environmental impact on the locals. GrSCM therefore plays quite a vital role in ensuring that the damage on the environment is minimised and at the same time improving the process of the SCM. The objective of this study was to explore the current situation of the Malaysian construction supply chain management in general, and in this paper, more specifically on the GrSCM. In the context of this paper, the implementation and effect of GrSCM in the construction industry will be explored.

The next section will organise and present previous literature related to the above mentioned concepts such as SCM, SCM in the construction industry and GrSCM, which is then followed by the method section, results and discussion, before completing this paper with the conclusion and further recommendations are put forward.

LITERATURE REVIEW

Supply chain management (SCM) has traditionally been viewed as a process wherein raw materials are converted into final products, then delivered to the end-consumer (Beamon, 1999). SCM was once a too-good-to-be-true concept where much change is required and were difficult to achieve as it requires the involvement of not only the staff of one's organisation but also of those along the supply chain. One of the key obstacles in successfully implementing SCM is the cost associated with the communication and coordination between those along the supply chain.

Traditionally, companies often view themselves as having customers and suppliers. They did not even consider the potential for their customers or suppliers to become a partner. In many industries, the customers and suppliers were treated as their competition, fearing that they would be taken advantage of by them (Fredendall & Hill, 2001). SCM has brought a significant change in how most organisations view themselves.

The advancement of three main aspects, namely technology, management paradigm, and workforce development, has successfully improved the SCM in facilitating communication through the availability and use of the rapidly advancing information and telecommunication technologies, coordination made simplified through collaborative management techniques shared among the players, and process improvement along the supply chain with the skills enhancement of the employees (Fredendall & Hill, 2001).

Any discussion of construction supply chain management (SCM) is usually informed by a wide range of definitions. One of the popularly accepted definitions for SCM would be the one defined by the Council of Supply Chain Management Professionals (CSCMP, 2010), where SCM is defined as:

“Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.”

New and Westbrook (2004) suggest that network must be built between the companies along the supply chains to provide complementariness between inner and external abilities – in other words, to create the value in each link, effective supply chains need to be supported in networks that extend beyond the immediate linkages of exchange. In the same way that an individual in a society finds it difficult to

survive isolated from others, a company that lives isolated in business is vulnerable and may fail in time unless they possess a unique skill or talent which gives them the power to influence market (for example a monopoly supplier or oligopoly of few suppliers in a market of buoyant demand).

According to Pryke (2009), supply chain is a linear process which only exists on a high level of abstraction. At an applied level, there is very limited linearity due to the social and market exchanges that create a social and technical system which, once in place, are observed as a dynamic network relationship. Due to the nature of the construction industry, the relationships between the key players are interconnected as shown in Figure 1.

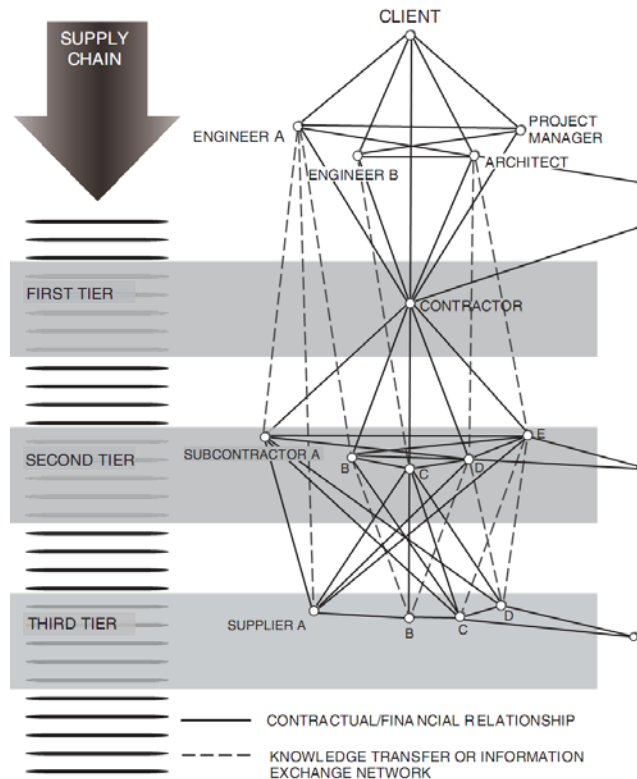


Figure 7 - Supply chains and networks
Source: Pryke (2009)

The definition by the CSCMP was further refined for the research taking into consideration the construction industry context of the study. The definition used for the purpose of this research was:

“SCM encompasses the planning and management of all activities, processes, entities, which involve the flows of materials, finance, human resource, equipment, and information within an integrated network which consists of providers (suppliers), transformers (builders), and receivers (customers) with the objectives to improve customer satisfaction, delivery, and quality of products, and to reduce costs in the cooperative and collaborative environment.”

Construction industry concerns not only property development but the built-environment as a whole. As the construction industry continues to develop the built environment within the natural environment, stakeholders are accountable to achieve the highest standards of quality, occupational safety and health, and environmental practices (CIDB, 2007). Key players for the industry are required to uphold these social responsibilities to ensure that the nation’s social and economic goals achieved proper balance.

Effective and good environmental practices have been underlined as a key Strategic Thrust 3 of the CIMP. Strategic Thrust 3 of the CIMP is the encouragement for the industry key players to better perform their Corporate Social Responsibility (CSR) in the provision of 'green' design and construction (Keoy & Hassan, 2009). With the environment as one of the key Strategic Thrusts of the CIMP, the construction industry is expected to respond by adopting more environmentally friendly processes to produce products that would not harm the environment (Keoy & Hassan, 2009).

Environmentally friendly construction and CSR is fairly new in the Malaysian construction industry but this practise has been in place in the developed countries for over the last few decades. GrSCM practices combine green purchasing, green manufacturing/materials management, green distribution/marketing and reverse logistics. The main objective for implementing GrSCM is to enhance environmental and financial performance (Keoy & Hassan, 2009). However, GrSCM is a fairly broad concept that is difficult to define due to its wide scope and difficulties in identifying the boundaries of this concept (Sarkis, 2009). Keoy and Hassan (2009) categorised the scope of GrSCM to include the internal and external environment management, investment recovery and design for environmental practices. Reviews of previous literature categorised several themes that emerged over the past 20 years worth of literature, namely green design, green manufacturing, reverse logistics, green operations, and waste management (Guide & Srivastava, 1998; Srivastava, 2007). For the most part, going green has mainly to do with the increased profit and reduced cost effects, at the same time caring for the environment (Srivastava & Srivastava, 2006; Darnall, Jolley, & Handfield, 2008).

METHODOLOGY

As this research is an exploratory study, a mix-mode approach was used, using a combination of quantitative and qualitative approaches in order to investigate the level of GrSCM practices in the desired construction context. This approach was adopted from Golicic, Davis, and McCarthy (2005), who advocated the balanced approach to research. Their justification for this approach is that the body of knowledge can gain "rich data that can be gained through qualitative methods and the generation of formal theory through the quantitative approach" (p.27).

Two phases were used in this approach, which consists of the inductive qualitative approach and the deductive quantitative approach. During the inductive phase, the identified phenomenon will be explored by performing data collection, which is then systematically described and organised. The output from this process will be a substantive theory that is ready for verification and exploration. The deductive cycle can then commence through an in-depth literature review to obtain the formal theory. Field or real world verification can then be performed to test and thus prove or disprove the theory, which leads the focus back to the phenomenon when the researcher tries to make sense of the findings and perhaps may launch another inductive cycle as new data are observed. This process is summarised in Figure 2.

The objective of this study was to explore the current situation of the Malaysian construction supply chain management in general, and in this paper, more specifically on the GrSCM.

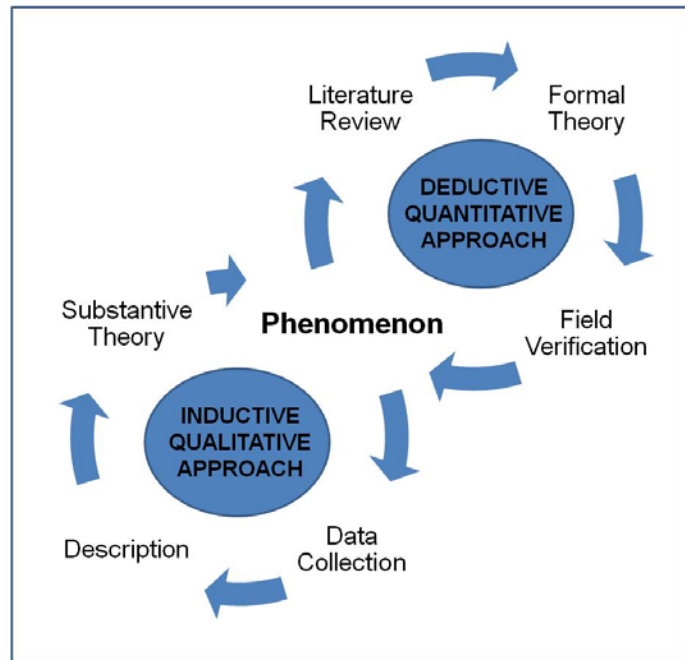


Figure 8 - The balanced approach model (adapted from Golicic et al., 2005)

The scope of the research was further narrowed down to the industrialised building system (IBS) industry involved in the construction of residential buildings, and companies that were registered as between G5 and G7 companies. The population lists were obtained from several authoritative sources. The supplier and contractor lists were obtained from CIDB and the developer list was obtained from REHDA. However, the restrictions set by narrowing of scope cannot be applied to the developer list, since it is not feasible to determine their status individually through personal contact.

An interview protocol was used to conduct preliminary interview sessions at several construction based companies to identify the problems and issues involved in terms of SCM. From the preliminary interview, a questionnaire was then developed by combining the initial findings with the literature. Once the questionnaire has been developed, a pilot study was done to refine the questionnaire as well as the interview protocol for the main round of investigation.

A total of 300 questionnaires were sent (the minimum sample size were calculated using an online application at <http://www.raosoft.com/samplesize.html>) out to various companies via post that were randomly selected, and a total of 20 interviews were performed at the various companies for the main investigation sessions. The interview sessions were recorded, where allowed, and later transcribed. Where recording was not possible, extensive note-taking was done while the interview was being conducted.

In the context of this research, various questions were asked in order to address and explore this issue. A total of 16 questions were presented to the respondent regarding this topic based on the preliminary interviews and previous literature, using a nominal type (Yes/No) questions. There is also a Likert Scale question using a scale of 1 (Low) to 4 (High) to see the perception of the respondents towards the green concept.

The resulting data was processed using NVIVO and SPSS software. NVIVO was used to organise the data according to themes and ideas, while SPSS was used to run statistical analysis, such as descriptive, reliability tests, Pearson correlation, and others.

RESULTS AND DISCUSSION

Section J of the questionnaire addressed the issue of GrSCM, where it looks at the level of adoption of this concept. The first question (J1) had enquired about the types of environmental management systems or standards that have been adopted by the company. The two options provided by the questionnaire were ISO 14001 and Eco-Management and Audit Scheme (EMAS), which is the European standard. Table 1 shows that 35.2% of the sample has implemented the ISO 14001 standard in their respective organisation. Surprisingly, there are two companies (3.8%) that implement the EMAS standard in their organisation. This is perhaps because the respondents are not sure or are not aware of the standards being used by their companies. Another possibility for this result is that the company is a branch, subsidiaries or a company collaborating with a European company which implements EMAS. These companies could also be engaged in work overseas, or multinational companies have engaged them in performing local work, where both scenarios may force these companies to adhere to the international or foreign standards, such as EMAS. This explains the small percentage of the respondents that replied that they adopted EMAS standard in their organisation.

Table 1.
Companies that adopt an environmental management standard

Item Description	Response	
	Yes (%)	No (%)
<i>Companies that adopt ISO 14001 standard</i>	35.2	64.8
<i>Companies that adopt EMAS standard</i>	3.8	96.2

Other management systems that have been implemented as mentioned by the companies surveyed include “EMP”, “ISO 1900”, “ISO 19000, 18000”, “ISO 9001”, “ISO19001-2008”, “ISO9001:2000”, and “MS ISO 2000”.

The next question (J2) had specifically asked about the respondent’s opinion regarding how they perceived the level of environmental management practice within their respective companies. The question was in a Likert Scale from 1 to 4. From Table 2, it can be observed that the respondents had mid-view of the level of practice of environmental management in their organisation, with a mean of 2.53. This was considerate to be at a moderate level.

Table 2.
Perceived environmental management practice in organisation

	Mean	Std. Deviation
J2 - Level of EMS implemented	2.53	.919

The third question (J3) asked about the sources where environmental awareness stems from to create the awareness within their respective company. Some of the sources offered by this question include law and regulations, media, local residents, contractors, partners, self awareness, and others. Other sources of environmental issue awareness that were mentioned by the respondents include authorities and shareholders.

As can be seen in Table 3, the source for environmental awareness that is ranked the highest would be from laws and regulations (72.2%), followed by self awareness (51.9%), and local residents (42.6%). Meanwhile, the lowest ranked source for environmental awareness issues was partners (27.8%).

Table 3.

Environmental issue awareness from various sources

Item Description	Response	
	Yes (%)	No (%)
Environmental issue awareness from law and regulations	72.2	27.8
Environmental issue awareness from self awareness	51.9	48.1
Environmental issue awareness from local residents	42.6	57.4
Environmental issue awareness from contractors	38.9	61.1
Environmental issue awareness from media	37.0	63.0
Environmental issue awareness from partners	27.8	72.2

From the above table, it can be observed that most of the respondents were sensitive enough about the issues of environmental management, and for the most part, these companies get information and are made aware from laws and regulations. More than half the respondents were sensitive enough about the issues of environmental management that they were self aware of these environmental issues, meaning that these companies took their own initiatives to familiarise themselves with the issues surrounding environmental management. The third ranked source that these companies get information about environmental issues would be the local residents, which is the pressure from the surrounding locals for them to conform to the environmental laws.

The following question (J4) addresses the issue of green practices within the respective organisation. These practices include the purchase of environmentally friendly construction materials, which are recycled and non-toxic materials; compulsory reporting on environmental practices by their suppliers, like disclosure of pollution discharges and disposal procedures; auditing to reveal environmental performance; compulsory implementation and maintenance of environmental management systems; compulsory certification of their environmental management system by a recognised standard such as the ISO 14001; and working with suppliers to help reduce environmental impacts by integrating changes in the product design and materials used.

Table 5 describes the practices the responding companies adopt which contribute to the overall GrSCM practice.

Table 5.

Environmental issue awareness from various sources

Item Description	Response	
	Yes (%)	No (%)
Materials purchase with environmentally friendly attributes	59.3	40.7
Make suppliers disclose information about environmental practices	33.3	66.7
Work with supplier to reduce environmental impact	31.5	68.5
Audit suppliers to evaluate environmental performance	27.8	72.2
Make suppliers implement and maintain environmental management system	25.9	74.1
Make suppliers obtain standardised certification for environmental management system	22.2	77.8

Over half of the respondents contribute to the GrSCM by purchasing materials with environmentally friendly attributes.

CONCLUSION AND RECOMMENDATIONS

From this study, it can be concluded that the green issue in supply chain management does require further investigation because of its due potential that have been observed in other settings. In the Malaysian construction industry however, supply chain management, more specifically GrSCM, is still at a stage where there is plenty of room for improvement. Based on the findings, it was revealed that the players within the construction industry are still not open and trusting of their partners to the extent that they can openly share sensitive information in order to perform joint business and mutual manpower development. It was observed that the players are in some level aware and concern with the environmental issue. However, this is still at a very low level as just over half of the respondents are self aware regarding the green issue.

Therefore, further research should continue to explore this concept in the Malaysian construction industry since there is still more knowledge to be gained through research about GrSCM. The question of trust and honesty remains unexplored territory for those researchers brave enough to venture into it, since this was identified as a very sensitive area during the interviews. The population sample could be increased to include other levels of contractors. The questionnaire could be refined further, and thus perform more efficiently at collecting the data. A more rigorous method than mail survey could be employed to recover more data and get a better response rate.

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