CONSTRUCTION SUPPLY CHAIN MANAGEMENT (CSCM):
PRACTICES IN THE MALAYSIAN CONSTRUCTION INDUSTRY

by

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ABSTRACT

The construction industry, is characterised by fragmentation and poor coordination by its players which leads to inefficiency, waste, poor quality, and safety problems. Supply Chain Management (SCM) is viewed as a vital strategic tool for corporate competitiveness since it can improve efficiency and productivity while reducing the overall operating costs, as observed in various manufacturing sectors. Malaysia, wanting to improve this situation, has followed suit by introducing the Construction Industry Masterplan (2006-2015) through the Construction Industry Development Board (CIDB), with emphasis on enhancing the value chain that has lead to research initiatives by the government to investigate the applicability of Construction Supply Chain Management (CSCM). This paper presents the findings of a research effort in exploring this issue. The study employed a mixed-mode approach, implemented through both interviews and questionnaire surveys, to explore the internal (internal supply chain – information dissemination, management leadership, relationship development) and external (external supply chain – customer and supplier relationship management) parts of the construction supply chain. The Rasch Measurement Model was used to interpret and support the findings, which was further furnished with the themes uncovered during the interview sessions. The findings revealed that the construction industry players were currently moderate level implementers of the CSCM practices, and the players viewed CSCM as a viable approach of improving the Malaysian Construction industry.

KEYWORDS
Supply Chain Management (SCM), Rasch Measurement Model (RMM), Construction Industry

INTRODUCTION

Like its counterparts in many countries, the construction industry in Malaysia is characterised by fragmentation and poor co-ordination among project participants which leads to inefficiency, waste, and quality and safety problems. Moreover, the construction industry pays inadequate attention to the protection of the environment: the participants see the responsibility as lying with others; and various authors identify different main players. The concept of supply chain management (SCM) is viewed as a strategic tool which is vital to corporate competitiveness and portability in today's operating environment (Burgess, 1998). The application of SCM can improve efficiency and productivity, and reduce overall operating costs (Lambert et al., 1998). Like the traditional approach to business for which SCM offers an alternative, in Malaysian construction, business relationships are based on narrow, short-term interests, and win-lose arrangements.

In order to address these problems, in September 2005, the Construction Industry Master Plan (2006-2015) was launched by the Construction Industry Development Board (CIDB) (2007) to set out further goals for the industry achievements. CIMP is the blue print to transform the Malaysian construction Industry into a professional, productive, knowledge base and progressive contributor to the country GDP. The blueprint laid down seven strategic thrusts. Strategic Thrust 1 of the CIMP, which reads as to “integrate the construction industry value chain to enhance productivity and efficiency”, emphasises on the need to increase efficiency and productivity through collaboration and integration of the supply chain and sharing best practice. This means that the application of supply chain management is important. However, at this point in time the application of SCM methodology in the local construction arena is still alien to the industry players.

Based on the above scenario, as well as the urgent need of the Malaysian construction industry to chart its direction toward strengthening its foundations, it is appropriate that this study to be carried out to clearly identify the real
issues in the supply chain management of the Malaysian construction industry in order to minimise problems and wastages which could directly improve the capability of Malaysia to compete in the era of international globalisation.

LITERATURE REVIEW

O’Brien (1999) noted that the existing manufacturing research in supply chain management, while useful, does not readily translate to a construction environment; given the transient nature of production in construction projects. He concluded that relatively little is known about construction supply-chain management. Nonetheless, it was recognised that SCM promises an engineering basis with which to design, plan, and manage construction projects in a collaborative manner.

Research on construction SCM is relatively scarce, therefore, this paper presents the findings of one applied research effort in exploring this issue. The study employed a mixed-mode approach, implemented through both interviews and questionnaire surveys, to explore the internal (internal supply chain – information dissemination, management leadership, relationship development) and external (external supply chain – customer and supplier relationship management) parts of the construction supply chain and their effects on supply chain performance.

Supply Chain Management Practices Under Study

From the internal perspective, there were five practices that were explored for the study, namely three internal practices and two external practices, all of which are explained in the proceeding sections.

Information Dissemination

In the present competitive industrial and business environment, information becomes one of the most valuable assets to the organisations, as information is anything that reduces uncertainty. Davis (1993) found that the uncertainty that is generated in the network or supply chain (such as late deliveries, order cancellation, and machine breakdowns), are the real problems that are faced by the organisation. This finding is supported by Mason-Jones and Towill (1997) who revealed that reducing uncertainty is an issue in redesigning the supply chain in order to improve the effectiveness of information movement within the whole supply chain. In addition, companies also face challenges such as reducing information processing time, improving the value of information, and decreasing the costs of processing and distributing the information (Walsh & Koumpis, 1998).

Focusing the information supply chain in isolation is a shortcoming, as most managers realise that information is needed from the whole supply chain in order to make a sound decision (Sarkis & Sundarraj, 2000). As the backbone to an effective SCM, the flow of information should not only be from suppliers to customers but also bi-directionally (Bechtel & Jayaram, 1997).

Management Leadership

Management leadership refers to top management to inform employees that business survival does depend on adapting supply chain to be flexible to customer needs (Min & Mentzer, 2004). Top management takes action to inform employees to value supplier-customer relationship and shares tactical or strategic supply chain information and provides various education opportunities (Jaworski & Kohli, 1993). Fawcett and Magnan (2002) discussed the importance of managers to understand supply chain management dynamics well before re-engineer any supply and logistic practices. They have argued that management involvement and support is required to promote harmony between supplier and customers for a value chain to be flexible. Management leadership in the strategic planning process will consider decentralisation of operations, global outsourcing and strategic alliance with partners to achieve flexibility, speed, proactive and reduce time to market (Gunasekaran et al., 2008).

Relationship Development

Historically, many of the purchasing relationships were arms length and often adversarial in nature with the aim of getting the best price. Firms tended to search just around the corner in justifying their needs for materials, fast delivery, ease of communication and so on. But, when businesses switched from local based to global based, the complexity of sourcing, procurement and communication started to take its toll. Then, the increasing needs of practicing good Relationship Development (RD) has come into perspective. In manufacturing industry, studies show that good SM
practice plays an important part of SCM performance of an organisation. Then, only it could lead to greater organisation’s performance.

**Supplier Relationship Management**

Supplier Management involves organising, controlling and development of supplier relationships in view of increasing the purchasing contribution to profit. It is a practice through which uniform sourcing, evaluation, classification and development of suppliers are achieved. It involves the management of supplier base (supplier selection), supplier development and supplier integration (combining internal resources with those of key suppliers) (Antonette et al. 2002).

One relatively common assumption in supply chain management is that trading partners eventually develop trusting, long-term relationships wherein information sharing results, among other benefits, in more accurate forecasts, shorter order lead times, less use of safety stock and ultimately higher profits for the participants. Studies on buyer/supplier relationship have been conducted for quite some time (Anderson & Narus, 1990).

Meanwhile, in today’s environment, supplier management’s focus is no longer on single transactions, but rather on a symbiotic, long-term approach to all the players involved. Gone are the days of an adversarial buyer-supplier dance that ended in a completed delivery and terms that both parties could only live with. Today SM has grown into greater attention, focus on win/win supplier relationships; the imperative is to work together with suppliers for mutual gain and to seize the full innovation potential. This requires early involvement of suppliers in the design process, dedication to a continuous dialogue, and an understanding of how to extract the full value of a supplier’s offerings (Spens & Wisner, 2009).

**Customer Relationship Management**

Research based on customer relationship management assessment model demonstrated a positive correlation of good business performance (based on eight criteria combined) and good customer management (Woodcock, 2000). Conversely, companies that do not set up good customer management practices are likely to be poorer business performers. Some important relationships that link to effective Customer Management practices could be viewed as follows:

- Improving the way customers are managed brings back significant rewards.
- Improving CM practices must be holistic which involved a series of actions designed to improve the whole CRM model, namely,
  - leadership and development
  - management and motivation of people and core suppliers
  - measurement criteria
  - processes and activities

Customer management denotes a company-wide business strategy embracing all client-facing departments and even beyond. When an implementation is effective, people, processes, and technology work in synergy to increase profitability, and reduce operational costs. Similar to that of Supplier Management, customer management’s focus should also no longer be on single transactions, but rather on a symbiotic, long-term approach to all the players involved.

**METHODODOLOGY**

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 1.

The objective of this study was to explore the current situation of the Malaysian construction supply chain management in general, but the scope of the research was further narrowed down to the industrialised building system (IBS) industry players 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.

FIGURE 2
THE BALANCED APPROACH MODEL (ADAPTED FROM GOLICIC ET AL., 2005)

An interview protocol was used to conduct preliminary interview sessions at several construction based companies to indentify 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. 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 observe the perception of the respondents towards the green concept. The resulting data was processed using NVIVO and Bond & Fox Steps software. NVIVO was used to organise the data according to themes and ideas, while Bond & Fox Steps was used to run the Rasch Measurement Model analysis.

RESULTS AND DISCUSSION

Demographics

The respondents involved in the research were the key players from the construction industry, namely suppliers, developers and contractors. The reliability of the distributed survey questions is excellent with Item reliability value of 0.97, indicating the consistency of the survey questions in seeking the respondents’ perception on SCM practices. The
reliability of person’s response is also excellent with Person reliability value at 0.96 indicating that there is consistency in the response provided by the respondents. Generally, the survey result is reliable and the data can be further scrutinised.

Total respondents involved in this survey were 53 which could be categorised into contractors (52.8%), developers (24.1%) and suppliers (20.8%). From Table 1, the majority of the respondents are local company which is 71% companies, while the others are 15% Multinational companies, 9% Joint Venture companies, and another 5% companies did not mention their types of companies. There are 51% Bumiputra companies, 40% non-Bumiputra companies, and 9% of the companies did not mention their status, meanwhile 47% of the companies are involved in both building and infrastructure construction project.

### TABLE 1
SUMMARY OF DEMOGRAPHICS FROM THE STUDY (%)

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Status</th>
<th>Types of Companies</th>
<th>Year of Org. Tenure</th>
<th>No. of employees</th>
<th>Category of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bumi</td>
<td>Non-Bumi</td>
<td>Local</td>
<td>JV</td>
<td>Multi-</td>
</tr>
<tr>
<td>Contractors</td>
<td>28.3</td>
<td>24.5</td>
<td>47.2</td>
<td>3.8</td>
<td>5.7</td>
</tr>
<tr>
<td>Developers</td>
<td>13.2</td>
<td>13.2</td>
<td>13.2</td>
<td>9.4</td>
<td>3.8</td>
</tr>
<tr>
<td>Suppliers</td>
<td>11.3</td>
<td>9.4</td>
<td>15.1</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>52.8</td>
<td>47.2</td>
<td>75.5</td>
<td>15.1</td>
<td>9.4</td>
</tr>
</tbody>
</table>

**Rasch Measurement Model Findings**

Using the Rasch Measurement Model (RMM), as shown in Figure 2, it can be seen that the Persons Outfit mean square is 1.07 and the Items Outfit mean square is 1.02, indicating that the data is productive for measurement (Mean Square range of 0.5-1.5 – productive for measurement). Figure 2 also shows that the standard value (ZSTD) for Persons is -0.3 and Items -0.1 indicating that the data have reasonable predictability (ZSTD range -1.9 to 1.9, so data have reasonable predictability) with high reliability for both Person (0.96) and Item (0.97).

Again, using RMM, a person map was established to show the separation and to get the general idea on what is the current SCM practice in the construction industry is like. As shown in Figure 3, the players are pretty much equally divided between the person mean indicating that there are some SCM practices in the construction industry but are more moderate rather than in the good or bad practices.

**FIGURE 2**
OUTPUT OF THE RMM USING FOX & BOND STEPS

Calculating Fit Statistics

<table>
<thead>
<tr>
<th>Persons</th>
<th>53 INPUT</th>
<th>53 MEASURED</th>
<th>INFIT</th>
<th>OUTFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCORE</td>
<td>COUNT</td>
<td>MEASURE</td>
<td>ERROR</td>
</tr>
<tr>
<td>MEAN</td>
<td>408.1</td>
<td>155.3</td>
<td>0.11</td>
<td>0.13</td>
</tr>
<tr>
<td>S.D.</td>
<td>106.0</td>
<td>28.8</td>
<td>0.73</td>
<td>0.05</td>
</tr>
<tr>
<td>REAL RMSE</td>
<td>0.14</td>
<td>ADJ.SD</td>
<td>0.71</td>
<td>SEPARATION</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items</th>
<th>181 INPUT</th>
<th>181 MEASURED</th>
<th>INFIT</th>
<th>OUTFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEAN</td>
<td>COUNT</td>
<td>MEASURE</td>
<td>ERROR</td>
</tr>
<tr>
<td>MEAN</td>
<td>119.5</td>
<td>45.5</td>
<td>0.00</td>
<td>0.24</td>
</tr>
<tr>
<td>S.D.</td>
<td>33.0</td>
<td>6.7</td>
<td>1.45</td>
<td>0.07</td>
</tr>
<tr>
<td>REAL RMSE</td>
<td>0.25</td>
<td>ADJ.SD</td>
<td>1.42</td>
<td>SEPARATION</td>
</tr>
</tbody>
</table>
Approximately 55% of the respondents are at the top half of the map, indicating that they are practising moderate to good SCM practices in most of the activities in their organisation. The other 45% of the respondents are below the mean (bottom half of the map) indicating that they do not practice good SCM or they only practice good SCM in some activities in their organisation.

**FIGURE 3**

THE OVERALL ITEM-PERSON MAP PRODUCED FROM THE STUDY

As seen in Figure 3, the respondents are grouped into five groups which are High, Good, Moderate, Low and Poor Practitioners of SCM Practices with 1.9% High Practitioners, 52.8% Good Practitioners, 1.9% Moderate Practitioners, 41.5% Low Practitioners, and 1.9% Poor Practitioners of the overall SCM practices.
TABLE 2
SUMMARY OF SCM PRACTICE PRACTITIONERS CATEGORIES IDENTIFIED FOR THE STUDY

<table>
<thead>
<tr>
<th>Category Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Practitioners</td>
<td>Persons of this group is observed to view the practices as very important and thus would find it very easy to practise</td>
</tr>
<tr>
<td>Good Practitioners</td>
<td>Persons of this group is observed to view the practices as important and thus would find it easy to practise</td>
</tr>
<tr>
<td>Moderate Practitioners</td>
<td>Persons of this group is observed to view the practices as more or less important and thus would find it more or less easy to practise</td>
</tr>
<tr>
<td>Low Practitioners</td>
<td>Persons of this group is observed to view the practices as less important and thus would find it less easy to practise</td>
</tr>
<tr>
<td>Poor Practitioners</td>
<td>Persons of this group is observed to view the practices as not important and thus would find it not easy to practise</td>
</tr>
</tbody>
</table>

Further inspection of the results, according to the components of the SCM practices, had revealed that out of all the practices, the Customer Management component was revealed to be the easiest to practise by the industry players, while the least amongst the components that were studied, was the Information Dissemination component (Table 3).

TABLE 3
RESULTS OF THE RMM ACCORDING TO SCM PRACTICE

<table>
<thead>
<tr>
<th>SCM Practice</th>
<th>Probability of Being Practised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Management</td>
<td>76.90%</td>
</tr>
<tr>
<td>Supplier Management</td>
<td>75.95%</td>
</tr>
<tr>
<td>Relationship Development</td>
<td>67.90%</td>
</tr>
<tr>
<td>Management Leadership</td>
<td>56.20%</td>
</tr>
<tr>
<td>Information Dissemination</td>
<td>46.25%</td>
</tr>
</tbody>
</table>

From this finding, it can be surmised that the companies under study had practised higher levels of the external components of the SCM practices, namely Customer and Supplier Management, then the internal components of Relationship Development, Management Leadership, and Information Dissemination.

CONCLUSION

This research looks into the practice of SCM in the Malaysian construction industry. The motives behind this study were to test the identified dimensions involved in SCM practices among three categories of construction players, namely contractors, developers and suppliers. At the end, it was discovered that, in general, SCM is being practised reasonably within the construction system in this country. The five dimensions surveyed have translated their own significant values along the SCM practices and strategies. Some of the item means (representations of dimensions reviewed) stand along the midway of the Logit Ruler (a gauge of probability measure) which translates the dimensions’ complexity in practice, but most of them reflect the favourable acceptance among the construction fraternity.

Respondent-wise, the RMM instrument used in analysing the survey illustrates that there are explicitly clear separations among total respondents in terms of practice levels. In many of the variables studied most of the respondents fall into the Moderate Practitioners category, while only a very small number (1.89%) that can possibly be referred to as high performers. Despite having moderate to good practice levels of SCM practices, SCM understanding is still rather low (Abdullah et al., 2010). This gives room to further educate the industry players regarding these practices.
REFERENCES


