Supply Chain Management on IBS Implementation in Klang Valley Construction Industry: Challenges and Issues

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Abstract. Industrialized Building System (IBS) is a system where the components of the building are manufactured in a factory and it will be transported to the site to form the structures. The supply chain management (SCM) is a system where the delivery flows of the IBS products from manufacturers to the site. The aim of this research is to identify the major challenges and to analyze the issues on IBS implementation in SCM in Klang Valley from the manufacturers perspective. The methodology used in this paper is based on primary data through questionnaire and interview. Questionnaires were sent to the Manufacturers. It can be concluded that this paper attempts to present more on the challenges and issues that those companies of manufacturers faced during their success journey in finding integration in their supply chain. The main contributions of this paper are integrating all the supply chain integration challenges and issues on IBS. Therefore, these contributions will be helpful for the organization of manufacturers and IBS players that establish the integration in their SCM.

Keywords: Supply Chain Management, Construction Industry, IBS, Manufacturers.

1. Introduction

IBS is a construction system that manufactured in a factory to minimize the additional work at the site [1]. The use of IBS can provide speedier work completion due to the replacing of the components on-site construction. Furthermore, the government of Malaysia has started the implementation of IBS in their construction contract for IBS towards 2010. Therefore, Malaysia can improve and experience more in the construction industry performance across the globe. In addition, to stimulate domestic economic activities and enhance growth, the construction industry plays a role in the governments’ effort [2], [3].

As growth globalized economy, the managing entire supply chain has become dynamic to the successful completion of a construction project. The strategy is very important to manage economic demand through construction to be more effective when projects are implemented innovatively and speedily [4]-[7]. However, the usage of IBS is still lower compared to others countries. In addition, a good SCM should be realized by the IBS players such as manufacturers, suppliers, developers, consultants, and contractors in order to enhance the performance of IBS construction approach [8]-[16]. Furthermore, understand the SCM is the major factor to improve the management and integration of supply chain [17], [18]. There is a problem related to delay in the construction industry which is a shortage of manpower, materials and variation order. Besides that,
if the construction site is locating too far from the factory or suppliers, the contractors will have to bear some extra expenses for the transportation cost in the delivering product to the site.

According to [8], [9], [19], [20], the development of IBS in Malaysia is not well accepted by the parties for failure to keep the construction cost estimates in projects IBS. However, IBS can be seen and believed to reduce the number of challenges to improve this system, especially in structural elements the at Klang Valley [5], [16], [21].

The construction management of IBS project is important to ensure the successful implementation of IBS project. Therefore, this paper is mainly focusing on identifying the challenges and determine the issues in the SCM implementation of IBS in Klang Valley construction industry. This research is carried out by using a quantitative method which is questionnaires surveys in order to collect the data. The questionnaires are distributed to the IBS manufacturers who working in Klang Valley.

2. Methodology
To achieve the mentioned objectives, the methodology used in the preparation for this research was broadly divided into two (2) parts which are a literature review and questionnaire survey. A quantitative approach was employed using structured questionnaire survey to the manufacturers to gather the information and investigate about the challenges and issues of the SCM on IBS in Klang Valley construction industry.

2.1. Literature Review
Seuring and Müller [22] defined a literature review is a systematic process that has a purpose which is to collect and analyze all relevant writings in the field by means of a structured search for literature. As a result, the conceptual content of the field can be identified and contributing to the theory development [23]. The literature review is an important element in the research because it describes how the proposed research is related to the prior research in statistics [24], [25]. It also shows the originality and relevance of the research problem. The literature review also justifies the proposed methodology and demonstrates the steps in preparing the completed research. The literature review is consisting of local and international referred journals, thesis, magazine, and websites [26]. Furthermore, the literature review provides information regarding the background of this research.

2.2. Questionnaire design
A pilot survey has been done and questionnaire is design based on the comments on the pilot questions. The number of questionnaires distributed to respondents was about 70 sets. The questionnaires were distributed by using google form and visits to offices and sites. The collection data of the main data will be done through it with the relevant parties involves on IBS in Klang Valley construction industry. All of the respondents have different perceptions about the challenges and issues that occur in SCM on the IBS in the construction industry.

This research has also involved the collection of data through semi-structured incorporated with interviews. All interviews are recorded and transcribed. The respondents of the interviews are selected on the basis of their experience on IBS. The questionnaire was structured into three sections; section A (demographic information of respondents’ personal particulars in the construction industry), section B (the challenges of the implementation of the SCM in IBS construction industry) and section C (The issues in the SCM in the construction industry). Questions in section B and C are designed based on Likert’s scale of five ordinal measures scale of agreement for each statement which is from scale 1 to 5. In addition, the data collected need was analyzed using software such as SPSS Version 21 and interpreted in order to achieve the research objectives.

This paper is limited to the literature review and opinions from respondents that involved in the SCM implementation of IBS in Klang Valley construction industry in the manufacturers’ perspective which will provide a better result for the improvement of the SCM in this state if the challenges are identified.

3. Result and Analysis
This research focuses on the manufacturers perspective and a pilot research was conducted to ensure that the questionnaires are reliable and suitable for the research. The questionnaire survey was distributed randomly about 70 sets respondents from the companies in the Klang Valley, but only 35 of them had given the feedbacks with respond rate of 50%.

From the survey, it shows that majority of all them are engineers which have 45.7% followed by supervisors which have 31.4%, technician and others which are an operator, safety officer, and admin have 8.6% each, and the managers just 5.7%. The most respondent is from Engineer, which have 45.71%, while the rest are from managers, supervisors, technicians and others. The view from different position also helps in this
3.1. The challenges of SCM on IBS implementation

Figure 1 is the analysis of the mean index for challenges of SCM in implementing IBS in the construction industry which are provided in the form of a bar chart. Based on Figure 1, the result analysis shows the IBS requirement for a high level of coordination and integration of supply chains are from design, manufacturing, and construction stages are the highest challenge with the highest mean index which is 4.46, which is obviously majority all of the respondents agree. It means that the level of coordination and integration of supply chains of IBS requirement is high from each stage. This is due to the difficulties in working together and coordinating with their team which may have some conflicts in their scope of works.

Besides that, lack of communications between the manufacturer and IBS players will give the impacts on the quality of information and lack of skill and knowledge of the process and components of IBS will prevent interaction between IBS supply chain. Both have the same mean index which is 4.26 thus making these challenges second higher challenge of SCM in implement on IBS. Therefore, it shows that the respondents very agree with the challenges, this is because, the communication is a very important part of manufacturers and IBS players to avoid inaccurate design information, inaccurate data, and late updating of the required information. All of these problems could lead to the quality of the IBS delivery. The manufacturers themselves did not understand and familiar with the components and process of IBS. Therefore, this will hinder the interaction between IBS supply chain.

The mindset is more to the traditional role thinking can cause some challenges to supply chain on IBS adoption. The mean index is 4.14 which the respondents are agreed for this challenge. It shows that the rethinking of the old processes to move forward in the delivering of IBS from traditional management to SCM.

The customers demanding is a high priority in the supply chain implementation. It can be seen that mean index from the respondents’ feedback is 3.91, which is represents the majority of all respondents agreed with this challenge. Thus, these result shows that their expectations are transformed towards a greater level of services which is increased profitability or reduced cost of customer order management performance.

Last challenge is the commitment from the seniors’ managers to adapt this supply chain of IBS is still lacking. The mean index for this challenge is 3.89 which is all of the respondents agree. The seniors’ managers were refused to switch from the conventional process. In addition, they refused to learn new things of management to their company unless it gives a benefit to the company regarding the cost.
Figure 1. Mean Index Graph for challenges of SCM in implement on IBS

Figure 2. Mean Index Graph for Issues of SCM on IBS implementation

3.2. Issues of SCM on IBS implementation

From Figure 2, the result analysis shows that the highest issue is the involvement of the contractor and IBS players in the early design and construction stage can enhance the quality of the project with a mean index of 4.23, which all the respondents agreed. During the design stage, it is important if the manufacturers, contractors, and others IBS players involved in the design to prevent any crashes and errors. If there are any problems in the design, it will affect the SCM.

The second higher issues are SCM offers the potential not just to cut cost but also to generate new revenues and high profit in the IBS project implementation with a mean index of 4.20. The SCM could lead a high benefit which leads the cost reduction in the bank interest. The third higher issues are the supply chain logistic can be complex, involving multiple stakeholders which can affect the profitability with an average index of 3.94. The involving of multiple stakeholders could lead the fragmentation in design such as design clashes and errors, which it will affect the profitability and time consuming to redo the design. Finally, the IBS supply chain integration is technically challenging in the fragmentation among players and the mean is 3.80 which is the respondents are agreed for these issues. This is due to the misunderstandings and misconceptions among the IBS players and manufacturers in working together could lead the IBS supply chain integration.
4. Conclusions

From this paper, the challenges on IBS implementation of SCM in Klang Valley are identified. Based on the respondents’ feedback, the major challenges on IBS implementation of SCM that happened were IBS requirement for a high level of coordination and integration of supply chains are from design, manufacturing, and construction stages. The difficulties to work together of each team should not happen among manufacturers and IBS players. Next challenges are a lack of communications between the manufacturer and IBS players will give the impacts on the quality of information, and also a lack of skill and knowledge of the process and components of IBS will prevent interaction between IBS supply chain. Therefore, the communication skills and knowledge of IBS must have some improvement to ensure the delivery on IBS run smoothly to the site on time. These challenges are based on the respondents’ experiences in the IBS construction industry.

Based on the respondents’ feedback on the issues, the mean for all of the issues in Figure 8 is 4, where all respondents are agreed with the issues in the supply chain implementation of IBS. Therefore, the objective to determine the issues in the supply chain implementation of IBS in Klang Valley construction industry is achieved.

Some recommendation can be considered in SCM that the seniors’ managers must have a commitment to adapt this SCM of IBS instead using of traditional management; the client should not change the designs during the construction stage. This is because, if the client does that, there will have some problems during the manufacture the IBS product, therefore it will cause the project delayed. There also must have a speaker who is expert about the SCM on IBS to introduce or give a talk about it, so that the IBS players such as manufacturers, clients, contractors, and others players can gain some knowledge about this system and have a confidences level to adapt the system.

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References

[1] M. Qays, K. N. Mustapha, H. Al-Mattarneh, and B. S. Mohamed, “The constraints of industrialized building system from stakeholders’ point of view,” in IEEE International Conference on Semiconductor Electronics 2010, 2010.

[2] CIDB, “Industrialised building systems (IBS) - roadmap 2003-2010,” 2003.

[3] CIDB, Construction Industry Master Plan Malaysia 2006-2015. 2007.

[4] V. Ahuja, “IT Enhanced Communication Protocols for Building Project Management by Small and Medium Enterprises in The Indian Construction Industry,” Philosophy, pp. 1–401, 2007.

[5] A. S. A. Shukor, M. F. Mohammad, and R. Mahbub, “Supply chain integration challenges in project procurement in Malaysia: The perspective of IBS manufacturers,” in 27 th Annual ARCOM Conference, 2011, pp. 495–504.

[6] M. F. Mohammad, A. S. A. Shukor, R. Mahbub, and F. M. Halil, “Challenges in the Integration of Supply Chains in IBS Project Environment in Malaysia,” Procedia - Soc. Behav. Sci., vol. 153, pp. 44–54, 2014.

[7] A. S. A. Shukor, M. F. Mohammad, R. Mahbub, and F. Halil, “Towards Improving Integration of Supply Chain in IBS Construction Project Environment,” Procedia - Soc. Behav. Sci., vol. 222, pp. 36–45, 2016.

[8] K. A. Kamar, M. Alshawi, and Z. A. Hamid, “Industrialised Building System: The critical success factors,” in 19th International Postgraduate Research Conference, 2009, pp. 29–30.

[9] Z. A. Hamid, K. A. M. Kamar, and A. Mustafa, “The Critical Success Factors (CSFs) to IBS,” Proc. IBS Int. Semin. Malaysian IBS Int. Exhib. 2009 (MIIE 2009), Kuala Lumpur, 21st – 23rd January 2009, vol. 2009, no. October 2003, pp. 21–23, 2009.
[10] K. A. M. Kamar, M. Alshawi, and Z. Hamid, “Barriers to Industrialized Building System (IBS): the Case of Malaysia,” Built Hum. Environ. 9th Int. Postgrad. Res. Confrence, no. 2009, pp. 1–16, 2009.

[11] K. Kamar and Z. Hamid, “Supply chain strategy for contractor in adopting industrialized building system (IBS),” Aust. J. Basic Appl. …, vol. 5, no. 12, pp. 2552–2557, 2011.

[12] M. K. Kamarul Anuar, A. H. Zuhairi, G. Mohd Khairolden, C. Egbu, and M. Arif, “Collaboration initiative on green construction and sustainability through Industrialized Buildings Systems (IBS) in the Malaysian construction industry,” Int. J. Sustain. Constr. Eng. Technol., vol. 1, no. 1, pp. 119–127, 2011.

[13] K. A. M. Kamar, Z. A. Hamid, and N. Dzulkalnine, “Industrialised Building System (IBS) construction: Measuring the perception of contractors in Malaysia,” in BEIAC 2012 - 2012 IEEE Business, Engineering and Industrial Applications Colloquium, 2012, pp. 328–333.

[14] Y.-S. Shin et al., “ScienceDirect Development of Internship & Capstone Design Integrated Program for University-Industry Collaboration,” Procedia - Soc. Behav. Sci., vol. 102, pp. 386–391, 2013.

[15] N. Ernida et al., “The Strength Behavior of Self-Compacting Concrete Incorporating Bottom Ash as Partial Replacement to Fine Aggregate,” Appl. Mech. Mater., vol. 774, no. February 2015, pp. 916–922, 2015.

[16] N. M. Nasir, M. N. M. Nawi, M. K. I. A. Rahim, A. Y. Bahauddin, and A. Tapa, “A review of delay factors in Malaysian industrialized Building System (IBS) construction project,” ARPN J. Eng. Appl. Sci., vol. 11, no. 16, pp. 9868–9873, 2016.

[17] E. Scornavacca, E-Commerce and V-Business. 2007.

[18] S. B. Knouse and G. Fontenot, “Benefits of the business college internship: A research review,” J. Employ. Couns., vol. 45, no. 2, pp. 61–66, 2008.

[19] F. Ismail, N. M. Yusuwam, and H. E. A. Baharuddin, “Management Factors for Successful IBS Projects Implementation,” Procedia - Soc. Behav. Sci., vol. 68, pp. 99–107, 2012.

[20] C. Ezeah and C. L. Roberts, “Analysis of barriers and success factors affecting the adoption of sustainable management of municipal solid waste in Nigeria,” J. Environ. Manage., vol. 103, 2012.

[21] K. A. M. Kamar, M. N. A. Azman, and M. N. M. Nawi, “IBS survey 2010: Drivers, barriers and critical success factors in adopting industrialised building system (IBS) construction by G7 contractors in Malaysia,” J. Eng. Sci. Technol., vol. 9, no. 4, pp. 490–501, 2014.

[22] S. Seuring and M. Mueller, “From a literature review to a conceptual framework for sustainable supply chain management,” J. Clean. Prod., vol. 16, no. 15, pp. 1699–1710, 2008.

[23] K. Burgess, P. J. Singh, and R. Koroglu, “Supply chain management: a structured literature review and implications for future research,” Int. J. Oper. Prod. Manag., vol. 26, no. 7, pp. 703–729, 2006.

[24] S. J. Locke, L. F.; Spidurso, W. W.; Silverman, “The Function of the Proposal,” In Proposals That Work. pp. 3–24, 2007.

[25] K. S. Taber, “Psychology for the classroom: constructivism and social learning,” Teach. Dev., vol. 15, no. 4, pp. 555–557, 2011.

[26] J. P. Ollivier, J. C. Maso, and B. Bourdette, “Interfacial transition zone in concrete,” Advanced Cement Based Materials, vol. 2, no. 1. pp. 30–38, 1995.