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SUPPLY CHAIN INTEGRATION CHALLENGES IN PROJECT PROCUREMENT IN MALAYSIA: IBS CONTRACTORS' PERSPECTIVE

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Abstract
The Malaysian Construction Industry Master Plan (CIMP 2006-2015) identified the innovative approaches of Industrialised Building Systems (IBS) and its supply chains as having important roles in improving the productivity and quality of construction processes. However, the fragmented scenario in the construction industry leaves the IBS supply chain players with noticeable difficulties in terms of competitiveness and efficiency. Supply chains in IBS involve relationships between many organisations and processes, with the evolution of many specialised roles and embedded relationships. The procurement method is utilised as a mediator tool and as the means of controlling integration between players. Although efforts have been undertaken to enhance the IBS practice in Malaysia, various integration challenges have risen from amongst the IBS players. The purpose of the research is to identify the challenges of IBS supply chain integration with regard to existing project procurements. The methodologies involved a thorough review of literature and the qualitative method of using semi-structured interviews which were conducted amongst IBS contractors in Malaysia. The findings reveal role and responsibility, understanding the knowledge, risk liability, financial and contract matters and attitude and relationship are the challenge factors that hinder the successful integration between the contractor and other related parties. Such issues require much attention in pursuance of greater integration within the supply chains in the Malaysian construction project.

Keywords: Industrialised Building System, Integration, Malaysia, Procurement, Supply Chain

INTRODUCTION

The construction industry has commonly been plagued by fragmentation issues. These issues are attributed to the fact that the industry is made up of separate parties from diverse

professions that operate by their own rules. An analysis of the key characteristics of the construction industry indicates that the problems facing construction can be categorised into five broad areas (Morledge et al. 2009) which are: fragmentation, adversarial relationships, project uniqueness, separation of design and production and competitive tendering. In addition, weaknesses are caused by the increase in organisational complexity and contractual adversity which influence the efficiency and effectiveness of construction project teams (Dulaimi et al. 2001). Its complexity has been deemed to be very disintegrated and a more integrated approach to supply chain has been identified as a solution to various problems (Vrijhoef and Ridder, 2007).

Thus, in today's increasingly globalised economy, managing the entire supply chain has become vital to the successful completion of a construction project. Competitive global markets which result in increasing supply chain integration make it imperative for the construction industry to change, so that improvements are made to the relatively disconnected and fragmented construction supply chain. The strategy to manage economic demand through construction will be more effective when projects are implemented innovatively and speedily. Furthermore, for Malaysia to be a productive and high-income nation, Malaysians must be globally competent and competitive. This necessitates the Malaysian government to embark on rigorous initiatives and adopt the Industrialised Building System (IBS) as an innovative approach.

As a consequence, the IBS Roadmap (2003-2010) has been taken as an initiative to move forward. IBS provides speedier work completion due to the introduction of components replacing on-site construction. The use of IBS assures valuable advantages in context of the local construction scenario but new innovative management and procurement in IBS have still not been fully realised by the industry players. This is especially so in terms of good Supply Chain Management (SCM), the basic principle of which is rarely based on 'integration' approach. Thus, such initiatives may be hindered by the non-integration and adversarial relationship modes currently practiced in construction.

A number of case studies have shown that managing the entire supply chain has become a major factor in delivering a successful IBS approach (Blismas and Wakefield, 2009; Faizul, 2006), with the procurement method arrangement being utilised as a mediator tool and as the means of controlling integration between players (Pan et al. 2008; Gibb and Isack, 2001). A good supply chain integration practice will lead to good integration amongst players. This new way of working has to be related to the current trend in the Malaysian construction to move towards a more innovative and competitive scene. While much effort has been taken to enhance the IBS practice in Malaysia; establishing integration between IBS players is still a major hindrance, due to the lack of supply chain procurement practices (Faizul, 2006; Kamar et al. 2009). Therefore, the challenges in achieving successful delivery of IBS projects would be looking at encouraging integration through supply chain integration, which may have a value-added impact on the success of IBS project implementation and delivery.

This paper is structured into three parts. Firstly, the review covers a broad range of literature, providing a concise overview on the general approach of IBS in the Malaysian construction industry, challenges in supply chain integration and reviews on the supply chain, SCM, integration and procurement. The second part discusses the methodology adopted to collect data, including the choice and size of the samples. The final section includes a discussion and conclusions derived from evidence from the literature review and the qualitative semi-structured interviews.

IBS AND THE SUPPLY CHAIN INTEGRATION CHALLENGES: AN OVERVIEW

In today's global business, with regard to the development of technology and characterised by its great degree of repetitiveness and mass production, off-site manufacturing or IBS has been widely adopted across the globe. IBS is deemed to offer many advantages in overcoming problems such as influx of foreign labour and in enhancing the productivity and the quality of the construction industry. While IBS is being acknowledged generally as the term representing the prefabrication concept in Malaysia, various definitions have been offered to IBS over the past years. Warszawski (1999), defined IBS as a set of interrelated elements that act together to enable the designated performance of the building. In addition, Leesing et al. (2005) asserted IBS as an integrated manufacturing and construction process with well-planned organization for efficient management, preparation and control over resources used, activities and results supported by the use of highly developed components. While CIDB (2003), defined IBS as a construction system where components are manufactured in a factory, either on or off site, positioned, or assembled into place with minimal additional site work.

In this research the present authors emphasis IBS largely as construction process and an approach on manufactured components off or on site. Therefore, the understanding and interpretation of IBS is very important before its implementation. Following new emerging technology, the components of IBS in Malaysia can be categorised into five major types (CIDB, 2003): Precast Concrete Framing, Panel, and Box Systems, Steel Formwork Systems, Steel Frame Systems, Pre-fabricated Timber Frame Systems and Block work Systems.

Even after IBS had long been introduced in the Malaysian construction industry, it appears that the implementation of IBS is still low compared when compared to other developed countries. To cope with these challenges, the IBS Roadmap (2003-2010) was designed to assist Malaysia to move forward and capitalise on new technologies for the construction sector. One of the approaches taken by the Malaysian government to increase the level of IBS usage is by demanding more IBS approaches to be used in the construction industry. These initiatives can be seen through a series of developments starting from the provision of IBS in annual National budgets. In the 2005 budget, policies were outlined to give full exemption of levy imposed by CIDB for housing projects with IBS content of more than 50 percent. In the 2006 budget, IBS manufacturers were given Accelerated Capital Expenditure with a maturity period of three years on moulds. Then, in the Ninth Malaysian Plan Report and Treasury Circular, public projects were made to adopt or contain up to 70% of IBS construction approaches. This is further enhanced by the establishment of the National IBS Secretariat as the Coordinator through the Ministry of Works and an IBS Centre as the One Stop Centre.

Even with much support, encouragement and directions in Malaysia, the usage of IBS is currently much lower than it could be. These problems demonstrate that although the long introduced IBS has promised to solve and improve the current construction process, these practices have characteristically been facing a difficult task to establish integration and cooperation between parties involved (CIMP, 2007; Faizul 2006). Abd Shukor et al. (2009) conducted research to identify the key problems in the construction industry in general and IBS in particular. They classified possible problems into 16 significant themes and revealed that both the industry and the IBS players had not been very successful in their attempts to find the right solutions to the challenges encountered whilst indicating that the supply chain and procurement to be the root of most problems.

Among the challenges encountered were communication in terms of flow of information, conventional mindsets, problems in terms of coordination between various works and funding factors where the process of payments were not in order (Abd. Shukor et al. 2010) and through their research, they also revealed that there are a range of procurement stages that have prominent problems which make it difficult to integrate people. The same problems apply to the 'Design' stage and among the prominent problems encountered were the lack of coordination in design management among architects and engineers (discrepancy in design), lack of resources and budget limitations**.**

CIMP (2007) highlighted poor knowledge and unfamiliarity with IBS concepts and its benefits as one of the factors hindering integration among IBS players. In order for IBS to succeed, construction professionals should support and understand the construction and product delivery of IBS. Lack of integration among relevant players in the design stage has resulted in the need for plan redesigning and additional costs incurred if IBS is adopted. The disintegration happens because IBS manufacturers are involved only after the design stage (CIMP, 2007). Rashid (2009) in his statement argued that the possible mis-match between the design capabilities of the local engineering consultants and the manufacturing capabilities of the local building product manufacturers will disrupt or create upheavals to the IBS project delivery.

Therefore, the establishment of the IBS provision in the integration of the construction supply chains must take place. The challenges of integration amongst the IBS chain players need to be assessed in relation to the working practices in the current project procurement delivery arrangements approach in order to ensure cooperative working relationships that will lead to supply chain excellence.

SUPPLY CHAIN INTEGRATION THROUGH PROJECT PROCUREMENT

A review of literature indicates that the productivity and performance of the construction project is achieved by positive integration of supply chains involved. Thus, at the global level, managing and integrating supply chains has become a major factor in delivering successful construction projects. The term Supply Chain (SC) is usually informed by a wide range of definitions. Various definitions of SC exist in literature and have risen to prominence over the past several years. A review and analysis of the generic SC definitions from the early 1990s uncovered the definition of SC as interdependence of activities or process (Simchi-Levi et al. 2007; Lin and Shaw, 1998) as the linkages of companies (Samaranayake, 2005; Trent, 2004) and as a network of facilities or organizations (Mabert and Venkataramananrt, 1998; Christopher, 1992). It was agreed that all these definitions are relatively similar, with an emphasis on the linkages or networking of organizations or activities connected by demand and supply flows that are supported and accomplished by people.

The complexity of SC may vary greatly from organization to organization and activity to activity. It exists in both service and manufacturing organizations. Typically on larger construction projects, SC consists of a large number of players and involves a number of activities within each tier of players (Dianty et al. 2001). However, SC can be scoped in terms of the number of firms, activities and functions involved (Cooper et al. 1997). But, the integration and management of those supply chains in any situation is very important (Mentzer et al. 2001) and is promoted as a way to achieve supply chain success and

consequently, the success of the project delivery. SC and its management are vital for gaining competitive advantage in the globalized economy. Supply Chain Management (SCM) represents a new way of managing the business and relationships with other members of the supply chain. The concept offered by SCM has been recognized over the past several years as a tool, which will lead to a better integration amongst the construction industry players. A key word and basic principle of SCM is 'integration'. The focus of SCM in this research is on supply chain integration, a word that is rarely associated with the construction process as it is characterised by fragmentation.

Difficulty to integrate is attributed to the variety of professions and skills involved in the project delivery. The present authors also reviewed and analysed generic integration definitions in the literatures from 1973 – 2006. Definitions of integration were used to describe a sharing of knowledge, data and information (Vincent and Kirkpatrick, 1995; Funk and Wagnalls, 1973) a flow coordination (Fergusson, 1993) a merging of different disciplines and organizations (Jaafari and Manivong, 1999) a cooperation and working together (Barkley, 2006; Baiden et al. 2003; Strategic Forum for Construction, 2003; Austin et al. 2002; Moore and Dianty, 1999).

In today's scenario, competition in the construction industry is no longer between one-on-one organization but rather by their supply chains (Tommelein et al. 2009). In order to enhance the competition, the organization should work on integrating supply chains rather than executing tasks single-handedly. Furthermore, they must work in a cooperative manner (Zhendong and Zhenmin, 2010). This will enable the supply chains to focus on shared goals and objectives, leading to mutual benefit for individuals, organisations and society, but without undermining the ability to advance and compete by differentiation of skills, products and services (The Strategic Forum for Construction, 2003). Therefore, Vrijhoef and Ridder (2005) agreed that supply chain integration should be more successful in delivering construction projects and in granting more value and profitability. Clearly, there is a need for a mechanism through which these supply chain can be integrated.

The introduction of varied project procurement systems was brought on by the transformation of technology and the industrialisation scene. This was to ensure efficient and innovative project delivery systems and better performance aimed at meeting the changing demand of clients or customers. Saad et al. (2002) noted, alternative procurement routes, which include (Two-stage Competitive Tendering, Design & Build, Management Contracting and Construction Management) represent some differences in relationships, roles and power between design and cost consultants and the main contractor, and between the main or managing contractor and the specialist and trade contractor. These new approaches to procurement have resulted in some potential for greater collaboration and integration. Baiden et al. (2006) conducted research on the integration of project delivery teams by looking at the practices that took place within the context of procurement approaches because the current practice and arrangement of the players within the construction project supply chains helped to integrate the activities of the various players. Thus, procurement routes appeared as one of the enablers of supply chain integration because they provide the formal links within which supply chain integration is accomplished and prolonged (Hall et al. 2000).

Poor performance has been attributed to the continued use of procurement practices that do not encourage integration of the parties involved (Love and Gunasekaran, 1998). Traditional procurement method is usually competitively tendered to a contractor before work starts. The design must be completed before the commencement of construction. Each construction

process is undertaken by different parties, where individual parties are mainly concerned with their own interests. The Design and Build procurement method provides a single point of responsibility by the contractor and the client has only to deal with one person if faced with any problems. In Malaysia, the arrangements of IBS supply chains in Design and Build involve either in-house manufacturers who employ external designers and quantity surveyors or outsourcing to IBS manufacturers to precast and install and employing of external consultants to carry out design (Abd Shukor et al. 2011). Khalfan et al.(2005) described both procurement approaches varied in their roles and responsibilities but one of the key elements in all procurement methods is the management of the supply chain.

In the context of this research, integration of supply chian could be summed up and viewed as "bringing together a series of different organizations consisting of IBS key players (client, designer, contractor and specialist/manufacturer) which are linked by a flow of practices, information, financial and contractual relationships. This is to allow them to work together towards design and construction practices within the context of the project procurement delivery arrangement approach with the same common goals and objectives". In order to achieve effective integration, an assessment of the challenges faced by contractors in supply chain integration has to be conducted, in context of the Malaysian IBS construction project.

RESEARCH METHODOLOGY

Literature review and qualitative semi-structured interviews with consenting respondents were used in data collection. By interviewing a variety of IBS key players (clients, contractors and manufacturers), challenges of supply chain integration were identified. However, only the perspectives of IBS contractors are presented in this paper since all interviews were still ongoing as this paper was being written. Therefore, the data presented in this paper is only a portion of that which was collected and the conclusions presented here are based on interim findings to date.

Literature review was the first phase of the research with the secondary data derived from relevant books, journals articles, thesis and dissertations, conference proceedings and reports. The second phase involved the collection of primary data, wherein the information was collected through semi-structured interviews. A semi-structured interview approach was employed to achieve the aims of the study. All interviews were recorded and transcribed verbatim, each interview lasting approximately ninety minutes.

The respondents of these qualitative semi-structured interviews were selected from the IBS public projects provided by the Public Works Department. The respondents were selected on the basis of their experience on IBS and their interactions with other IBS players in the project. Letters were posted and e-mailed to the IBS contractors. Then, follow-up telephone calls were made for the interview arrangements. Accordingly, there are nine (9) contractors "Class A" under the Contractor Centre (PKK) and "Grade 7" under Construction Industry Development Board (CIDB) who were involved in IBS public project and have agreed to be interviewed.

FINDINGS AND DISCUSSION

To begin with, the interviewees were asked about their basic background, brief description of their position in the company's organisation and basic characteristics of their projects. Table

1 exhibits the respondents' current positions, experiences, types of IBS components and procurement adopted and project categories. The majority of the interviewees were in the top and senior management level and were very experienced. Their designations and experiences portray their high level of authority in strategy and decision-making processes. This indicates that the data obtained are quite reliable and accurate. The various projects that have been undertaken in Malaysia using IBS can be arranged according to the categories of buildings constructed. The results revealed that the majority of the interviewees undertake precast panel as the most familiar type of IBS involvement and that the Traditional procurement and Design and Build procurement were the common types of procurement used in IBS in the Malaysian construction industry.

Company	Current Post	Experience (years)	Type of IBS components	Types of procurement	Project Categories
A	Manager Design Management	15	Precast Concrete Panel	Design & Build	Schools
B	Senior Manager Business Development & Contract	11	Precast Concrete Panel	Design & Build	Residential Buildings
C	Senior Manager Procurement	9	Precast Panel	Traditional	Commercial Buildings
D	General Manager Contract	12	Precast Panel/Shear Wall	Traditional	Commercial Buildings
E	Project Manager	19	Precast Panel	Design & Build	Residential Buildings
F	Contract Manager	18	Precast Panel	Design & Build	Schools
G	Senior Project Manager	15	Precast hollow system	Design & Build	Hospital
H	Senior General Manger	13	Precast Concrete Panel	Design & Build	Schools
I	Project Manager	10	Precast Concrete Panel	Design & Build	Schools

Table 1: *Current Post, Experience and Project Characteristics.*

In order to identify the challenges that prevent integration amongst contractors, the interviewees answered questions on how they interacted with other IBS members in the supply chain of a particular project within the procurement arrangement they adopted. Based on the results of the interviews the perceived challenges to their integration were presented as follows:

Roles and Responsibilities

More than half of the interviewees claimed that everyone especially the designer should be aware of the responsibilities of the project and fully understand the way of work. Seven out of nine interviewees mentioned that the designers are not fully aware and fail to understand

the implications of their design choices. This results in the contractors themselves having to do extra work to solve the conflict and to find solutions to their construction methods and choices of IBS components. Furthermore, Interviewees B and C raised the problems of interdependencies in traditional delivery entrenched the problems of integration between IBS players. The problem occurs as everyone does not work on the basis of what is actually needed by the person who is going to use their works (Nicolini et al., 2001). Moreover, Nicolini et al., (2001), highlighted that the interdependence issues are aggravated by traditional rigid demarcations between designers and builders. Simarly, the other five interviewees who adopted Design and Build procurement with design and construction under one responsibility, declared the same challenges.

Knowledge and Understanding

More than half of the interviewees claimed neither the architect, mechanical, structural engineer nor the client themselves understood or were familiar with the process and components of IBS. Four out of seven interviewees claimed that the architects' drawings did not match with the structural engineers' drawings, and this was made worse when the mechanical engineer came over to match their services. Besides, interviewee H stated that they are limited specialists/manufacturers in the market and even though they are experts, they do not have any experience in handling school jobs or the big volume. Thus, they fail to advise suitable solutions for the right type of design component. Furthermore, interviewees B and H, also highlighted in Design and Build procurement detail client requirements should be considered at the early stage before construction starts, because the IBS approach will incur more cost if there is failure in design which will create more problems during installation. Out of seven, the other two interviewees stated they do not have any problems with regards to knowledge or interdependencies, because they have their own group of consultants who understand each other's capabilities. Furthermore they claimed they have knowledge and experienced in IBS. Lack of knowledge or understanding of IBS by other players will hinder interaction between the main contractors with their supply chain, whether in traditional procurement methods or design and build project delivery. This is supported by the research done by (Blismas et al. 2009; Blismas and Wakefield, 2008) who assert that the strong theme for the drivers and constraints in offsite manufacturing both concern skills and knowledge.

Risk Liability

Risk liability between structural designers and specialists/manufacturers is very important in manufactured components. Hallowell and Toole (2009) pointed out that the manufactured component must have a proper engineering design because each of these components has a direct impact on the performance of the final structure. Interviewee H claims that they have problems on design and supervision issues between their structural engineer and specialists/manufacturers since most of the structural elements are designed by IBS specialists/manufacturers. He further explained that even though under Design and Build procurement, the contractor is the leader, they have difficulties to work together and coordinate with their team. This is because the structural engineer declined to verify and be responsible for the drawing that has been designed and produced by the manufacturer although it has proper engineering design. The engineer even refused to supervise the work although this has been accounted for in their professional fees. Meanwhile, the specialists/manufacturers also refuse to supervise the work on site because they are not paid for that supervision. This has been supported by (Thanoon et al. 2003) who found that IBS implementation has been heavily criticised by lack of coordination among parties involved.

Financial and contractual matters

Financial and contractual issues appeared to be important matters for the main contractors. Interviewees B, C and D claimed that under client related causes, the traditional method of payment seemed to present challenges. A major reason posited among the contractors to adopt IBS is that IBS construction project delivery is seen to be more expensive than the conventional method. IBS is seen as incurring high initial and set-up costs (Blismas and Wakefeld, 2008; Badir et al. 2002). The procurement of construction material is the responsibility of the contractor. Once the materials are already on site, the contractor is paid 75% for materials on site in their progress payment, which are not incorporated in the permanent works, to ease their financing costs or cash flow. However, the IBS set-up is different; the contractors have to pay the specialists/manufacturers huge amounts of payment at the initial stage in order for the manufacturer to proceed with their precast component order. Thus, this shows that IBS involves factory-produced building components where their material on site (precast component) is ready at the manufacturing site. This scenario is identified as one of the hurdles of IBS adoption for the contractor whether in Traditional method or Design and Build delivery, because they need efficient management and planning of their finances. This is more so as delays occur under certain circumstances.

As highlighted by one of the interviewee: "*….the client should be aware our problems, especially on precast product, the client should consider our material (precast product) at the manufacturing factory as material on site."*

It was thought that, in order to improve IBS project delivery and enhance their working relationship the client should trust the contractor to undertake the task and responsibilities or any win-win situation between them through improvement of their method of payment. This is also supported by Bilsmas and Wakefield, (2009) and Kamar et al. (2009) who revealed that IBS players need more reliable payment mechanisms and contracts. They added if they change conventional methods to IBS; the payment mechanism for IBS should be duly reviewed.

A second financial and contractual challenge is due by client and consultant factors. According to interviewees F and H, the problems arise when the client amended their original concept of design and build where client pay direct fees to the consultants (direct payment concept). This will discourage cooperation and disable response and the consultants will not readily adapt according to the main contractor's needs. Design and build entails the sole responsibility of the contractor to carry out and be responsible for not only the construction but also the design of the works including engagement of the design team who are, therefore contractually linked with the contractor and not the client (Molenaar and Gransberg, 2001; Ndekugri and Turner, 1994). The challenges of misunderstanding and conflicts that occur during the design and construction stage hinder integration amongst them.

Communication and Information

As the integrator of numerous supply chains, problem related to communication and information flow is identified as crucial to the main contractor. Most of the interviewees claimed that communication problems form an important part of the challenges they face in IBS construction supply chain. Some of the contractors complained about enforcement of "Forced Marriage" between consultants and contractors by the client under design and build as this impacted on the quality of communication and information of their integration. Unfamiliarity with each other causes problems arising from the lack of cooperation between the contractor and consultant. Problems include inaccurate design information, reluctance to

accept other members' opinion, inaccurate data, late updating of the required information and late submission to the local authority. This indirectly influences the quality of their IBS project delivery.

Interviewee C who procured through Traditional procurement highlighted that: *"they can communicate well, very good communication but everybody think about dollar and cent, limited transparent of information….there is hidden cost from the manufacturer/precaster…"* In design and build procurement, Interviewee F highlighted that, *"…even though the manufacturer have done business relationship with them but there seem no trust element between them…for example…photo cannot be taken while visiting their factory*" . He claimed that there is no sharing of information and the manufacturer is not ready to share their technology. He further explained that unfamiliarity hindered their shared interest to complete a project as one integrated supply chain. Developing efficient communication throughout the tiers of the supply chain will ensure superior and reliable flows of information (Briscoe and Dianty, 2005).

Attitude and Relationship matters

Generally, attitude of the designers were criticized by the main contractor as one of the factors that challenge the integration between IBS supply chain. For example, the architects pride and arrogance about their design concept to protect their professionalism. They were reluctant to change their designs even though the designs will cause difficulties in the mould system of IBS components. Moreover, the main contractors who procured under design and build complained that the architect acted as the leader and held no respect for them, as the main contractor. There is no respect, understanding and commitment amongst IBS players. Furthermore, the majority of the main contractors interviewed felt that the designer was reluctant to change and stuck with their old mindsets as with the conventional process. This is supported by Kamar et al. (2010) who revealed that there is critical need to manage the design and manufacturing differently from the traditional way as IBS is different and needs a different mindset along with the right environment. This attitude impacted the time in designing and delivering the IBS project. Rethinking the old processes is now critical if the industry is to move forward (Kamar et al. 2010)

INTERIM CONCLUSIONS AND FURTHER RESEARCH

The research reports the data based on findings to date through literature review and semi-structured interviews on the challenges faced by IBS contractors on the integration of the IBS supply chain with regards to the existing procurement methods that they undertake. Role and responsibility, understanding of knowledge, risk liability, financial and contract matters and attitude and relationship are established as the challenges that hinder the successful integration of the contractor with the parties involved. The same problems are also experienced in UK, Dianty et al. (2001) and Millett et al. (2000) addressed the significant barriers exist to main contractor and supplier integration within the UK construction industry are the lack of knowledge and information, lack of trust and negative attitudes. These findings are in tandem with the thorough literature reviews conducted. The research findings also confirm that the IBS contractors whether procured through Design and Build procurement or Traditional procurement face similar challenges. This is justified because there are various supply chain arrangements in Design and Build procurements that might influence integration and the performance of the IBS project delivery. Thus, the issue of better integration is important to be addressed within the IBS construction. More extensive empirical research work on these areas is needed, especially on the appropriate practices and

the success and barriers factors of integrating the supply chain players with the arrangements of project procurement delivery. Finally, the study presented in this paper is part of an ongoing research, which will eventually attempt to further enhance the practices and implementation of Supply Chain Integration in relation to procurement systems, particularly in the IBS project delivery in Malaysia. Such developments augur well in support of the government's aspiration in moving towards a more efficient IBS construction approach.

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