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Construction Procurement in Industrialised Building System

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Abstract. The government, through CIDB Malaysia have continuously promoting Industrialised Building System (IBS) to increase the immense efficiency of the building performance structure. However, the level of IBS adoption among the construction players in Malaysia is still low and far from the government expectation. It is evident that most of the IBS projects developments in Malaysia are still conducted by using the conventional procurement method. This creates a number of issues such as reworks, time delay, rising cost, lack of communication and integration problem. Thus, this paper will identify existing procurement process used for IBS projects in Malaysia construction industry. Identifying existing procurement process helps in providing significant elements before creation of a more effective new procurement for IBS projects in Malaysia. Expert interviews was used, whereby 5 (five) interviews sessions were conducted with IBS experts in Malaysia construction industry. Thematic analysis was utilised to analyse the interview result by identifying the existing procurement process adopted in current IBS projects. Findings from expert interviews showed that there are three different procurement process commonly applied in current IBS projects. Result also shown that one of the significant barriers to IBS adoption is the current practice of procurement and team integration. Therefore, a more effective new procurement for IBS projects should be considered and pursued urgently in order to improve IBS implementation in the Malaysian construction industry.

Keywords-Industrialised Building system (IBS); procurement process; integration; Malaysia Construction Industry

1. Introduction

Procurement system in construction is defined as a process to organise and coordinate the related parties in the project, especially on defining their contractual relationship [1] and it is a major factor that contribute to project success [2]. Procurement is not only about forming a contractual relationship, but it also include a detail set of relationship defining and limiting the parties' rights, roles, duties, liabilities and responsibility of each project [3]. Therefore, in broad-spectrum, construction procurement can be referred as the project guidelines that determine the responsibility of the parties involved, including their contractual obligations and the activities to assist the client in obtaining competent construction services to complete their desired projects [4].



In the early construction era, traditional construction procurement system was developed to organise the tradesman such as carpenter, masonry, craftsman, builder etc. and dealing with materials suppliers. However, as clients’ needs has changed and construction has developed, alternatives construction procurement were introduced such as Design and Build, Management Contracting and Construction Management [5]. These new construction procurements are aim to fulfil and adapt the project with the new construction environment. The differences between each procurement are mostly on the contractual relationship, roles and liabilities among parties involved and the procurement strategy towards achieving the project priority such as speed to construct, fast track construction, price certainty, level of clients’ interference, and single point responsibility [6].

However, [7] revealed that many construction professionals do not really understand the various functions of different construction procurement systems. Due to this, they tend to use procurement that they familiar with, or procurement that gives most benefits to them without giving much attention whether that procurement will suit their project’s characteristics or not. As a result, some projects face many challenges, because the procurement they use is not suitable or less effective. [1] agrees with this argument and added that many projects which apply unsuitable procurement have more chances to face difficulties, thus prone them to be delayed, increase in cost, conflicts among project members and contractual and payment disputes which later involve civil court cases [5].

[8] showed that in her interview to six (6) respondents who involved in IBS projects, all of the six (6) respondents said that their IBS projects used Traditional procurement system as shown in Table 1.

Table 1. Current post, experiences, and project characteristics [8]

Company	Designation	Experiences (Years)	Types of IBS Components	Type of Procurement	Project Categories
A	Quantity Surveyor	7	Precast Concrete	Traditional	Hospital, Education Buildings
B	Professional Engineer	15	Precast Concrete	Traditional	Education Buildings
C	Senior Quantity Surveyor	10	Precast Staircase and Beam	Traditional	Quarters, Hall, Recreational Buildings
D	Business Development Manager	12	Steel Structure	Traditional	Pinewood Warehouse, Warehouse
E	Assistant Contract Manager	5	Steel Structure	Traditional	Warehouse
F	Assistant Contract Manager	9	Precast Concrete	Traditional	Education Buildings, Media Studio Facility

There are numerous studies regarding industrialised building system which most of the common research focus on definition, advantages of IBS, barriers of IBS, success factors to implement IBS, team integration, costing and many more. There is also discussion about procurement method used for IBS projects currently, which is still using traditional procurement method for IBS project. Therefore, this paper will identify the actual existing procurement process used for IBS projects in Malaysia construction industry.

2. Literature Review

2.1 Procurement Process

The term procurement, in its modern context, has been defined in various styles by different researchers and writers. This is hardly surprising as the term procurement is widely used in different context including commerce, industry, defense and construction. In order to arrive at a reasonably clear and common understanding of the meaning of the term procurement, therefore, it is important to

identify the context in which the term is used [1]. Procurement process defined as the strategic brief that will enable the development of a procurement process for the project that establishes how the team will be selected, how the project will be designed, what the parameters are and how project delivery will be implemented [2].

[1] said that there are seven main elements of the processes of construction procurement considered to be specific to Malaysia. The seven main elements may be divided into two broad categories: (1) the processes during pre-construction stage, and (2) the processes during construction stage. It is true that construction researchers have historically attempted to link their work to elements of general management theory, and to some extent to generally accepted theories of organizational behavior, but what has become increasingly evident in recent years is a more generally accepted understanding that the construction procurement process is largely, perhaps mostly, about people and the way they interact with each other and their environment. This has led to a considerable increase in interest in the application of theoretical constructs taken from the 'softer' disciplines such as communication, social and behavioral science, cognitive and industrial psychology and the influence of culture, ethics and personal beliefs. There are, strong reasons for believing that it is from these areas that the major improvements to existing construction procurement practice will be derived in the future.

2.2 Industrialized Building System

IBS is defined as a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site work [3]. [4] defined IBS as a system which uses industrialized techniques either in the production of components or assembly of a building or both. [5] classified IBS as "a system in which concrete components prefabricated at sites or in factories are assembled to form structures under strict quality control and minimum in situ construction activity." IBS is also defined as a construction process that utilizes techniques, products, components, or building systems which involve prefabricated components and on-site installation [4]. The components of IBS are manufactured either in a factory, on or off site, positioned, and assembled into place with minimal additional site work [6]. Almost similarly, [9] defined IBS as a mass production of building components either in a factory or at the site according to the stipulated specifications with standard shapes and dimensions and transported to the construction site to be re-arranged according to a certain standard to form a building.

The experiences in some developed countries such as Japan, Germany, and the U.K. indicate that there is a great potential for IBS to progress as evidenced by their growing market share. Indeed, the success of IBS in those countries is prompted by the concern for home buyers about long term energy saving, indoor air quality, and other health and comfort related issues, commitment, and cooperation between the public and the private sectors toward greater technological advancement and innovation. Clearly, if Malaysia wishes to imitate the success of those countries, a long-term comprehensive policy towards the industrialization of building and construction sector should be pursued [9]. As highlighted earlier, early efforts by the government to promote usage of IBS as an alternative to the traditional and labor-intensive construction method has not been making headway as anticipated. In an attempt to understand the poor diffusion of IBS, some researchers have investigated and identified a number of barriers to the effective implementation of the IBS [10].

3. Research Methodology

An in-depth review of literature was done in order to obtain information on the related procurement system and IBS construction. The literature review involved a comprehensive review of secondary data retrieved from various sources, including refereed academic journal articles, conference proceedings, textbooks, regulating bodies, and doctoral theses. To further clarify the actual scenario, expert interviews was conducted with the parties involved in IBS projects.

3.1 Data Collection

The expert interviews were conducted face-to-face on 22nd April until 8th May 2019. All interviews were recorded and transcribed, with each interview lasted for 30 to 40 minutes. Purposive sampling was used throughout these expert interviews. Since there only few IBS construction project currently in Malaysia, it is difficult to get a big number of respondents. This is because, according to [11], respondents in purposive sampling are the one who fulfil certain characteristics required for the research aim. Therefore, the respondents selected are the parties involved and experienced in the IBS projects.

3.2 Data Analysis

Thematic analysis were used for analysing the interview content. The six steps undertaken for this study follow procedure as suggested by [12];

1. Familiarise with collected data.
2. Assign preliminary codes to the data.
3. Search for patterns in codes/keywords across the different interviews.
4. Review pattern.
5. Define and name the pattern.
6. Produce report.

4. Result and Discussion

All the projects involved by the respondents are government-issued construction project, which are as shown in Table 2.

Table 2. IBS components in the project

PROJECT	IBS COMPONENTS IN THE PROJECT	
	Structure (Column/Beam)	Slab
Fakulti Alam Bina Universiti Malaya	-	40.00%
Lembaga Air Perak	-	40.00%
Sekolah Kebangsaan Tunas Bakti	60.00%	20.00%
Velodrome Nilai	80.00%	-
Pejabat Kastam Ipoh	70.00%	-

There are many components involve in construction projects, but based on the interview as the IBS components normally constructed for structure and slab of the building. There are around 20% to 40% of IBS components for the slab and 60% to 80% of the IBS components are constructed for the structure of the building. Based on Figure 1, overall from the five (5) IBS projects, three (3) experts are from the Quantity Surveyor of the IBS projects and two (2) experts are the Project Manager of the IBS projects.

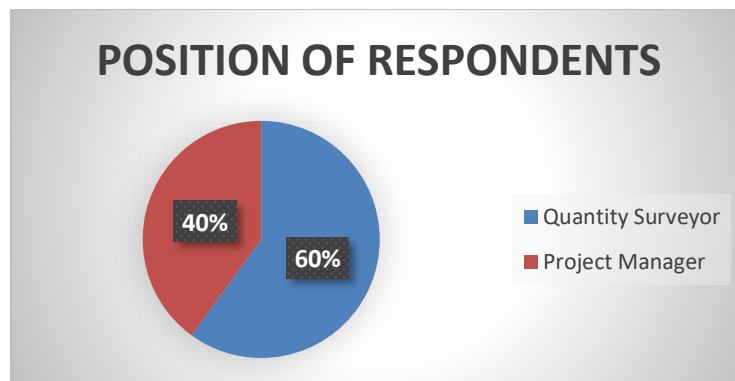


Figure 1. Position of respondents.

Figure 2 represent the working experience of the respondents. All of the respondents are experienced in construction and involved in IBS projects more than 10 years.

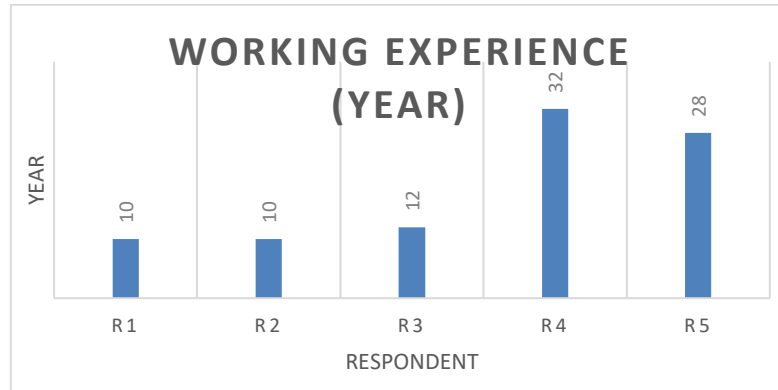


Figure 2. Working experience in IBS projects.

Figure 2 represent the working experience in IBS projects of the respondents. All of the respondents are experienced in construction and involved in IBS projects more than 10 years. R1, R2, and R3 are the Quantity Surveyors and R4 and R5 represent the Project Manager.

From the results, there are three (3) different procurement used in the current IBS project. Two (2) different procurement for Traditional procurement system and one (1) procurement for Design and Build procurement system.

Based on Traditional procurement system, the design and construction work will be made in sequential and they are conducted by different parties. The design work will be completed by the design team before the Main Contractor is appointed into the projects. All the members in the design team are appointed early during design stage and they have direct contractual relationship with the client. After they have finished the design for the project, the Developer will appoint the Main Contractor who will responsible to select the IBS Manufacturer. It is the Main Contractor discretion to appoint the IBS manufacturer that they think would be the best for the project. Therefore, the IBS Manufacturer cannot join the design team because they were appointed late, which is in the middle of the project. Besides, they only have contractual relationship with the Main Contractor and they have no contractual relationship with other parties in the project.

Another procurement used in Traditional procurement system, the IBS components already discussed and drawn by the Engineer during the design stage. IBS components also will be in the Bills of Quantities during the tendering stage and IBS Manufacturer / Contractor is one of the requirements for the contractor's selection.

For the Design and Build procurement system, the Main Contractor is responsible for the design and construction works. Therefore, the Main Contractor can appoint the IBS Manufacturer during the early design stage for the designing of IBS components. But, this is not happening in this interviewed project, which is the IBS Manufacturer appointed after the preliminary design by the Main Contractor as shown in Figure 3.

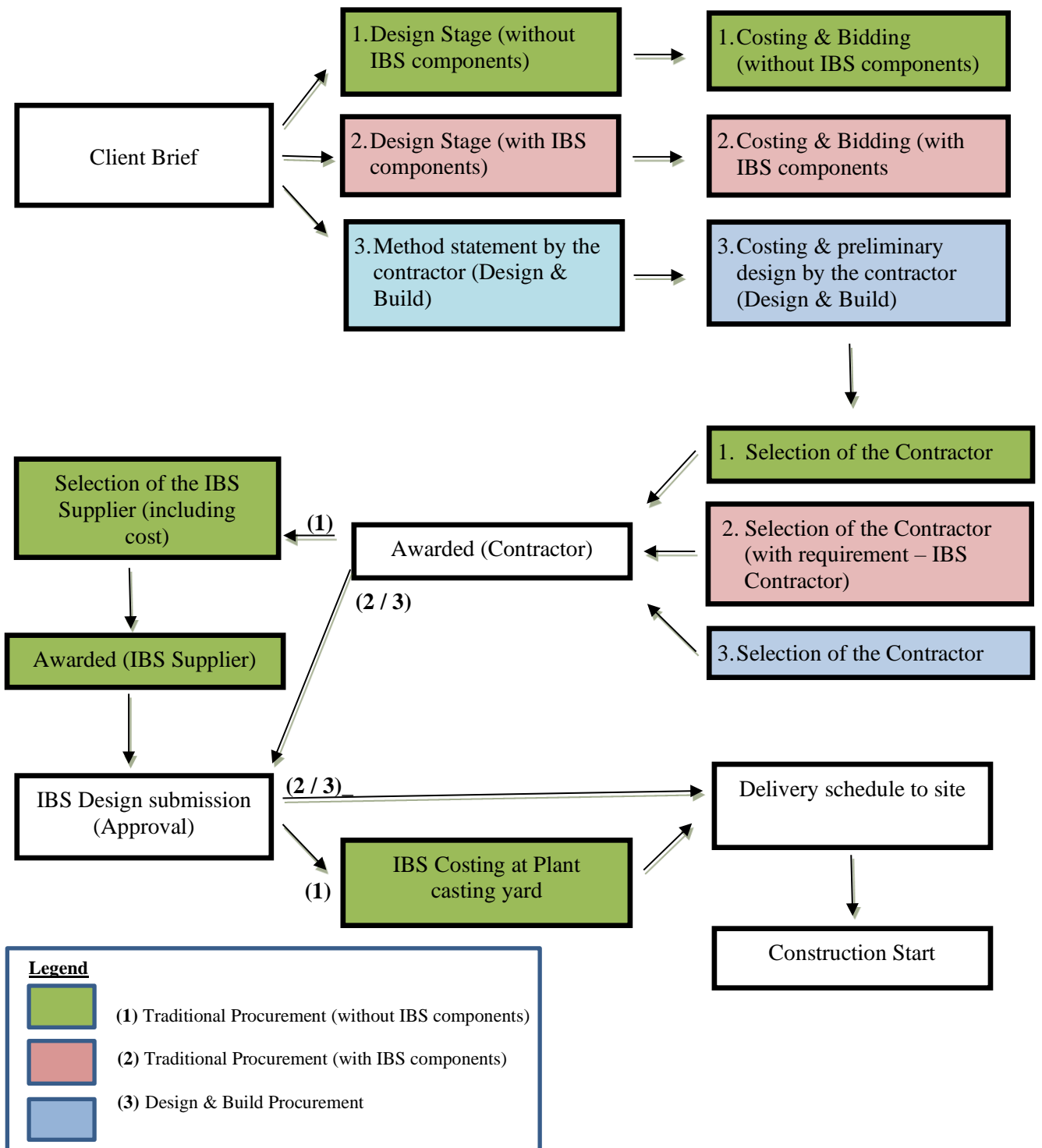


Figure 3. Procurement process in IBS project.

5. Conclusion

There is the need for the Malaysia construction industry to opt for a new and improved construction technique, in order to shift from the traditional construction to the modern method of construction and sustainable construction approach. In an attempt to address these issues, the government, through its CIDB Malaysia, actively promotes the adoption of a new or modern construction method system, entitled Industrialised Building System (IBS). The design of IBS construction project might requires designers to consider the ease to fabricate and to install the components but the common practice shows that contractors and manufacture of IBS components is involved only after the tender stage of the construction value chain. This lack of integration among relevant players in the design stage has resulted in a need for redesign and additional costs to be incurred if IBS is adopted [13]. This paper presented to identify the actual procurement system applied in Malaysia construction industry for IBS projects. The result of the research have shown that there are differences procurement used for current IBS projects. There are no standard guideline or framework for the procurement process in the IBS projects.

6. Acknowledgment

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