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A NEW PROCUREMENT METHOD FOR HOUSING PROJECTS IMPLEMENTING IBS MODULAR SYSTEM.

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Abstract

One of the significant contributors to Malaysian gross domestic product is housing projects. To increase the effectiveness of housing project performance, the Malaysian National Housing Policy identified several strategies including Strategic Thrusts 3 and 5 which is through research and development. The adoption of industrialised building system (IBS) has been recognized as one of the steps under this policy but progress has been very slow. Despite government efforts in introducing the IBS Roadmap as long ago as 2003, no detailed IBS building guidelines or standard regulations for procurement systems or contract documents in terms of tendering, design, construction and operations have been produced. A specific procurement system is required as IBS involves special procedures and processes which are different to traditional methods. Previous researches had concluded that the current traditional and modern procurement methods were not suitable for IBS projects especially in terms of project coordination and payment. The only available reference or guidelines for IBS projects are only related to product-based information. Since there is no specific procurement method for IBS projects, many problems on project delivery system have arose thus becoming barriers for IBS adoption. The objective of this paper is to discuss the procurement system which best suits IBS adoption in Malaysian housing projects. From the discussion, it is suggested that a new procurement model should be introduced to ensure the IBS can be efficiently implemented.

Keywords: IBS, procurement, housing project Malaysia, construction project.

1. Introduction

The Malaysian government has put many efforts and initiatives to improve the performance of the local construction industry and one of the steps is through the culture of innovative approach of prefabrication concept [1]. There are many terms to represent this prefabrication concept which include Modern Method of Construction

(MMC), Off-site Production (OSP), Off-site Construction (OSC), Off-site Manufacturing (OSM), pre-assembly, prefabrication, modularization and Industrialized Building. All these terms and abbreviations refer to the same concept and idea which is to move from manual in-situ construction which is labour intensive to a more sophisticated and organized construction method involving automated machines and advanced precast technology. In Malaysia, the term IBS is used to represent the prefabrication construction.

There are many advantages of IBS compared to conventional methods such as speeding up of the construction process, the integration of sustainability strategies, reduction of wastages during construction, and the minimization of hazards and risks [2][3][4][5][6]. Besides, Kamar et al. [4] and Thanoon et al. [6] identified IBS as a method to produce better construction performance in terms of quality, cost saving and safety compared to conventional methods. Another advantage is the higher quality of IBS components compared to conventional building materials, as all IBS components are factory made and have gone through efficient manufacturing processes with trained and skilled workers, repetitive procedures, and constant quality surveillance with strict control [5][7][6]. Moreover, IBS also can reduce construction time, which is less than half of the time taken in conventional cast in-situ construction [8][7]. All IBS components lead to the reduction of harmful impact on the environment [9].

IBS has been utilised around the world especially in developed countries. For example, in the United Kingdom, IBS has become the top priority in order to encourage efforts desirous for innovations and changes in thinking and working [10]. Besides the UK, countries following the same effort include Singapore, Hong Kong and Sweden [11]. Australia's construction industry also regards these transformations as bringing many advantages to all parties in construction, not only for local companies but also international ones [12].

Many researches have been conducted on IBS but their focus is only on product and process implementation from the perspective of manufacturers and contractors. The areas that have been studied among others are the barriers and implementation of IBS adoption [25], critical success factors [4], supply chain management [13][14][15][16], and awareness and acceptance level of contractors [2][17]. However, there is an evident lack of research on procurement for projects adopting IBS system. This paper will thus discuss the problems of current procurement practices in IBS projects and the justification to develop a new procurement system for housing projects adopting IBS.

2. Literature Review

The history of IBS in Malaysia started in the 1960's, but only became popular in 1998 when the Malaysian Cabinet endorsed the IBS Strategic Plan as the blueprint for the future [18]. This effort was aimed to transform the construction industry to be fully industrialised, slowly reduce the dependency on foreign labours and improve the quality of each project. To achieve this, the construction industry was encouraged to adopt IBS and the Construction Industry Development Board (CIDB) has been at the forefront to promote its implementation.

The IBS Roadmap 2003-2010 was introduced as one of the efforts by the Malaysian government to improve the usage of IBS [19]. Under this program, IBS will improve the current construction process through construction techniques where the components are fabricated in a controlled environment either on or off site, transported, positioned and assembled to form a structure under minimum additional site works [3].

At present, the government is focused on the latest IBS plan which is IBS Roadmap 2011-2015, the objectives of which are:

1. To sustain the existing momentum of 70% IBS content for public sector building projects until 2015.
2. To increase the existing IBS content to 50% for private sector building projects by 2015.

Under this IBS Roadmap effort, the government keenly encourages the usage of IBS in all construction sectors including housing projects [20]. The repetitious nature of housing construction especially when similar drawings and specifications are used makes IBS extremely suitable to be implemented. The pre-fabrication concept under IBS can ease the construction process and its potential has been realised by Syarikat Perumahan Negara Berhad in their affordable housing projects.

Currently, housing projects in Malaysia are associated with issues of delay, low quality, lack of skilled labour, and slow adaptation to the latest construction technology [21]. To increase construction industry performance, six strategies thrusts under the National Housing Policy (2012) have been formulated. Thrust 5 is focused on enhancing research and development towards the adoption of green and latest technology while Thrust 3 focuses on the effective implementation and delivery of housing projects. To achieve both Thrusts, the adoption of IBS is seen as the best mechanism and should therefore be improved.

In order to accomplish this target, Malaysia has implemented a new method of prefabrication construction technology to construct the houses with speedier time duration and better quality known as IBS [22]. The conventional construction method commonly used before IBS is high in cost and cannot respond to huge demands in a short time with good quality [21]. To achieve Malaysia's target in meeting housing demands requires excessive workforce, since on average only one house is completed per year for each worker [23]. The rising labour costs are the main factor in the increase of house prices. Friedman and Cammalleri [24] revealed that the labour costs have increased to 30% of the construction cost as compared with 10% in the 1980s. Hence, to resolve the housing demand in Malaysia, the government through the CIDB encouraged the implementation of IBS which has less dependency on manual labours but leverages instead on technology.

The successful IBS adoption in housing projects can also be seen in developed countries such as Living Solution (United Kingdom), Sekisui Home (Japan), Wenswonen (Netherlands) and Open House (Sweden) [25]. In Malaysia, CIDB has classified IBS into 5 categories which are:

- Precast concrete framed buildings
- Precast concrete wall buildings
- Reinforced concrete buildings with precast concrete slab
- Steel formwork system
- Steel framed buildings and roof trusses

However, many contractors in Malaysia are reluctant to implement IBS and prefer to continue using the conventional construction method [18]. There are many barriers that hinder IBS adoption and one of them is the existing procurement and contracting system which does not favour both pre-casters and contractors using IBS methods [4]. Besides, in term of manufacturing components, IBS demands high initial investment capital for pre-casters to acquire new plant, moulding machines, importing foreign technology and wages of skilled workers for installation purposes [20][6]. Due

to these problems, IBS is viewed by many in the industry as threats to their construction business and not as potential opportunities [20].

Cheap labour costs and easier access to procure ordinary construction materials also forced housing developers to stick with conventional construction methods than to implement IBS [4][9]. According to the IBS Roadmap Review 2007 [20], CIDB has identified several barrier factors that hinder the usage of IBS which mainly revolve around skills and knowledge, the procurement method, supply chain, lack of government policy, incentives and promotion.

Currently, the IBS manufacturers and contractors in Malaysia are involved after the tender stage while many researchers suggested that IBS manufacturers and contractors should join together from the initial design stage to allow for the integration of IBS pre-casters, designers, engineers and contractors [20]. Consequently, many IBS projects in Malaysia are not cost effective as it precluded the manufacturers from the early stage of design [17]. Besides, the contractors are also likely to pay the capital cost for IBS manufacturers by using their own money before the contractors can claim the amount from clients.

More than half of IBS manufacturers were very concerned on payment issues and worry about the commitment and capability of the contractors and clients based on current payment mechanisms [13]. Due to high initial and set up costs, payments are crucial for IBS manufacturers as this would ease the burden on financing costs and cash flow [12]. Payments are expedted to be made to the manufacturers before starting fabrication of the IBS components, not when the components are delivered to site [4]. This argument was agreed by Abd Shukor et al. [13], whose research on the IBS supply chain revealed that the current procurement system was not suitable for IBS projects because payments to IBS manufacturers will only be made upon delivery of the components to the site, not when the precast components were being manufactured. To further worsen matters, only 75% of the total delivered IBS components will be paid through the main contractor during the progress payment. These components also give rise to issues of site storage due to factors of size and weight. It therefore poses a huge conundrum for the IBS manufacturers and exposes them to high commercial risks. The initial payment to start manufacturing of the components is absent, and payment is only obtained after the many IBS components are delivered to site. Hence, the respondents under this research concluded that traditional methods and design and build procurement have not addressed this very pertinent issue, which is client-bias and unfair to IBS manufacturers and suggested a new procurement method which includes a more equitable and fairer payment mechanisms to be introduced.

Further, contractors are not in favour to utilise IBS because of the ease of the conventional construction method [9][6], as implementing IBS means that the need to adapt to a new system including on procurement which will involve different perspectives related to sustained budget, allocated time for training of human resources and hiring specialized machines or equipment. Based on previous studies by Nawi et al. [8], a lack of sophisticated equipment and specialized machineries proved to be a major problem that hinders work in IBS based projects.

Also, shifting from conventional system construction to IBS method seems to be too complicated, unless the contractor and IBS suppliers have a suitable procurement system on the use of IBS. Jaafar and Mohd Radzi [26] suggested that when there are changes in the method of construction, there is also a need to adopt a new procurement system. Using unsuitable procurement methods in IBS will not only affect the progress of the project, but also will affect the construction team, due to misunderstanding and misinterpretation of the regulations. Even though there are many

incentives offered to promote IBS practice, the procurement related issues still remain an obstacle [4].

In conclusion, IBS is often seen as a high risk process, minus any beneficial contribution to the industry players. Lack of a fair payment mechanism in IBS projects contributes to the project delays, as the contractors need to find extra capital to procure the IBS products before the products can commence manufacturing. A suitable procurement for IBS project will invariably expedite the project success [27]. Majority of clients are not aware of the procurement issue related to IBS projects and this problem often causes delays for projects. Chung and Kadir [28] also stressed that most IBS contractors and manufacturers need to refine and adapt the existing contract and procurement options chosen, to suit IBS requirements adopted in the projects.

3. The Need For New Procurement System

The rapid growth of the Malaysian construction industry has led to changes which has pushed the need for a new procurement system where the priority is on output [26]. Systems of procurements are considered as the key to project success, and have received great attention in the local construction industry [29], as well as in many other countries [29][30]. Nevertheless, knowledge on procurement is still limited [31]. According to research by Jaafar and Mohd Radzi [32], despite massive developments in procurement systems around the world, the procurement system in Malaysia has not evolved greatly since the colonial British era. Many clients in the local industry prefer to choose procurement systems considered familiar, even though the criteria and purpose of every project is different. For the private sector, cost has become the primary concern in choosing traditional procurement route.

Previous researches showed that for IBS to be effective, serious attention should be placed on the areas of supply chain and procurement [4]. Presently, research on IBS only focuses on the supply side but not on the demand side. According to Mohamad et al. [17], the activities involved in IBS projects can be divided into upstream and downstream activities. The upstream activities are design, planning and production works while the downstream activities are procurement system, supply chain, transportation system, legislation and regulation. For IBS to be applied in housing projects, the procurement system used by developers (demand side) must therefore be suitable and effective.

The current procurement practices in IBS projects are lacking in terms of establishing integration and coordination among the IBS players [14][4]. This was agreed by Blismas and Wakefield [12] who concluded that in producing a successful IBS project, the procurement approach must be suitable and which enthusiastically involved entire parties. Hence, choosing the right procurement which is fair and suitable for coordinating every party in the project is crucial.

Under supply chain principles, the method of procurement used in project development is determined by the client. For IBS projects, the coordination and performance of the project may be badly affected if the clients choose unsuitable procurement methods [16]. IBS requires early involvement of the project's members as it uses precise components with strict installation procedures. Without early involvement, parties in the project may not know the requirements of other team players; for example the architect responsible for designing the building may inadvertently miss crucial requirements of Mechanical and Electrical (M&E) and Civil and Structural (C&S) in his design. To avoid this, all designs and layout details must be well planned at the earliest possible stage to ensure that all requirements related to M&E and C&S are already considered and incorporated in the whole project design.

Given the fractured nature of design specialisations and production, early involvement of the relevant parties will also reduce the propensity of miss-matched drawings, or 'clashes' between architectural drawings and M&E and C&S drawings. Even in this technologically-driven time of CADD and BIM, this problem remains a recurring issue, with the architects and engineers having to redesign and re-do their work again, further delaying construction process.

Additionally, IBS requires a fairer and practical procurement system from start to finish in reaching the time target and reducing defects and errors [19]. The procurement must be planned so as to incorporate the manufacturing of the components, attendant transportation aspects, to the construction site and final assembly without delay. Any problems associated to procurement will cause delays which may affect both manufacturers and/or contractors. Moreover, the precast components are not suitable to be stored at site due to size and weight issues and these components should be placed near to the intended position to avoid double handling [13].

Improvements for IBS project delivery should include the coordination of working relationships among the parties involved and also the method of payment [12]. This was supported by Kamar et al. [4] who stressed that a new method of procurement should be introduced which includes the financial and relationships of members in the project. The researchers also suggested that if the method of construction is changed from conventional to IBS, the procurement for IBS must also be reviewed.

4. Conclusion

Due to the nature of repetitious construction, IBS has been identified to be suitable for Malaysian housing projects and its implementation should be improved. There are many advantages of IBS which can enhance the housing sector in terms of quality, cost effectiveness and faster construction turn-around. However, for IBS to be efficiently and effectively implemented, a proper procurement system which suits the interest of contractors and manufacturers is required. Research shows that the current procurement route does not provide enough protection and fair financial mechanism especially to IBS manufacturers. Therefore, it is suggested that a new procurement system should be developed which emphasizes on project coordination and payment mechanism as IBS requires early project team involvement and high initial capital investment. This paper discusses the justification on the needs for a new procurement system to be used in Malaysian housing projects implementing IBS system.

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