IMPROVING UTILISATION OF INDUSTRIALISED BUILDING SYSTEM (IBS) IN LOW COST HOUSING PROJECTS

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ABSTRACT

Housing in Malaysia needs to be expedited for sustainable growth as part of economic and social activities. The demand in low cost housing keeps on increasing especially in urban area. The implementation of Industrial Building System (IBS) in low cost housing is desired, however there is lack of incentives and awareness from government in improving IBS implementation in low cost housing projects. The objectives of this research were to investigate the current use of IBS in low cost housing projects, to identify the challenges of IBS usage in low cost housing and to recommend ways for enhancing IBS usage in low cost housing projects. The quantitative approach was used to gain information from contractors (G7) in utilisation of IBS in low cost housing projects. The data gathered was analysed into the form of percentage, tables, and charts by using SPSS software. Successful and effective implementation of IBS in the Malaysian construction industry can offer various benefits compare to conventional systems. Client with a good knowledge and awareness of IBS benefit will surely encourage appointed designers to design building according to IBS specification. These benefits are very important aspects in achieving the efficient and effective which will enhance the market share of construction industry as well as contributing to the Malaysian economy.

Keywords: conventional, IBS, low cost housing, sustainable, urban area

1. INTRODUCTION

Malaysia as a developing country and one of Asia’s rapidly growing and is targeting to become a developed nation by 2020 [1]. Throughout the Tenth Malaysia Plan (10MP) period, a total of 78,000 units of new low cost housing was said to be constructed by the Federal Government across the nation [2]. In addition, Malaysia has 72.8% of its population living in urban areas in 2011. This is expected to increase to 77.9% (higher than the official target of 73.5%) by 2020 with an average urban growth rate of 2.08% between 2015 and 2020 [3]. Therefore, this will come into the demands of affordable housing units becomes tremendously by Malaysian people. In 2014 Budget, government of Malaysia is providing subsidy of RM 30,000 per unit, which encourage developers to build more low and medium-cost houses [4]. Thus, this require improving utilisation of IBS in low cost housing which is important not only for determining the success of the project, but also in ensuring the perpetual good performance of IBS in low cost housing projects. In line with the Construction Industry Master Plan Malaysia (CIMP) 2006 – 2015, by 2015, the percentage of IBS used in construction projects should be above 80%. According to [5], there is lack of incentives and awareness from government in fostering the use of IBS implementation in low cost housing projects. IBS adoption requires more pull and push factors from the government [6]. Poor human capital development on IBS will affect not only the contractors but also the entire supply chain. Therefore, this research is carried out to improve utilisation of IBS in low cost housing projects.

2. IBS IMPLEMENTATION IN LOW COST HOUSING

A good knowledge and awareness of IBS benefits will be more encouraged to adapt IBS such as through assigning the designers to design their construction according to IBS. However, lack of awareness program to understand client needs or requirements and giving correct information on
IBS utilisation in low cost housing has contributing to lack of interest from the client and decision makers [7]. Furthermore, IBS has been introduced as a method with better productivity, quality and safety. IBS has been identified as a potential method to improve overall construction performance in terms of quality, cost effectiveness, health and safety, productivity and waste reduction [8]. According to [9], some of the benefits in utilising IBS in low cost housing are as following.

(i) High quality of finished products and minimal wastages due to factory controlled prefabrication environment.
(ii) Faster completion due to the IBS components replacing in-situ construction.
(iii) To reduce unskilled workers and fewer site workers.
(iv) Neater, cleaner and safer sites due to reductions of construction debris, site workers and materials.

Challenge for successful implementation of IBS is that many contractors and even engineers are not well aware of the IBS system and not involved with the use of any IBS system in their construction methods. Therefore, in order to create awareness among practicing engineers and contractors, campaigning is required to reassure that IBS systems are able to provide fast, economical and high quality products should be carried out. IBS system if properly designed can deliver a more efficient construction process due to many advantages such as greater speed of construction, simpler construction process, reduced environmental impact and reduce reliance on traditional labours [10]. Engineers with good technical knowledge in analysis, design, manufacturing and construction have the ability to produce systematic IBS systems. If the components are skilfully designed, erection can be carried out efficiently. Furthermore, complying with good practices in design and construction leads to high quality precast concrete structures.

To promote ways of IBS serve both to improve performance and quality in construction, as well as to minimize dependency on unskilled foreign labour in the construction market. According to [11], conventional construction methods have been known and proven to be wasteful, dangerous and messy due to the process of constructing buildings. It is important for Malaysian construction industry to evolve and be ready for the globalisation era where by increase of productivity, quality and safety are compulsory and the reduction of cost and construction period must be taken into account. Therefore, this research will focus on improving utilisation of IBS in low cost housing project. Some of improving ways in IBS implementation such as: provide a proper assessment and verification scheme for IBS products, manufacturers, contractors, and workers; offer incentive for the users of IBS; to provide research and development centre for IBS.

3. METHODOLOGY

To accomplish the research objectives, a quantitative research approach was adopted in this research. In addition, literature review were conducted to compare the current use of IBS in low cost housing projects, identifying challenges of IBS usage in low cost housing projects, and reviewed ways in improving IBS implementation in low cost housing projects. Data collected was used questionnaire survey and analysed using SPSS software. The respondents of this research involved G7 contractors includes project manager, project engineer, site supervisor and engineer towards acquiring the utilisation of IBS in low cost housing projects at Johor Bahru, Johor. The transformation of the whole industry depends on the readiness of contractors as project implemented to use IBS. G7 employ many professional such as huge number of workforce, sub-contractors and specialists in their projects. G7 contractors dominate the IBS market as they have better capability to invest in mass production with the updated and advanced technology.
4. FINDINGS

There were about 140 copies of questionnaires distributed to the targeted respondents (G7 contractors) consisted of project manager, project engineer, site supervisor and engineer. The researcher managed to collect back 52 questionnaires from the respondents. The totals of 140 questionnaires were dispatched by mail and hand. After one month, 52 responses were returned, of which (37.1% response rate) were completed clearly. The respondents involved various types of professional and experience as shown in Table 1 and Table 2.

Table 1: Working Experience

<table>
<thead>
<tr>
<th>Working Experience</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>22</td>
<td>42.3</td>
</tr>
<tr>
<td>5-10 years</td>
<td>16</td>
<td>30.8</td>
</tr>
<tr>
<td>15-20 years</td>
<td>10</td>
<td>19.2</td>
</tr>
<tr>
<td>21 years and above</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 2: Position in Organisation

<table>
<thead>
<tr>
<th>Position</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>9</td>
<td>17.3</td>
</tr>
<tr>
<td>Project Engineer</td>
<td>7</td>
<td>13.5</td>
</tr>
<tr>
<td>Site Supervisor</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>Engineer</td>
<td>16</td>
<td>30.8</td>
</tr>
<tr>
<td>Others</td>
<td>14</td>
<td>26.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

4.1. Current IBS Usage in Low Cost Housing Project

Figure 1 reveals that the result from the survey conducted, IBS usage for precast beam is the most significant usage in low cost housing project. Initially, based on the research, precast concrete framed building is ranked (1), (2) and (3). Precast concrete systems are also known as hybrid system because it uses conventional method and precast slabs. In some situation this method are prove to be more handy where the projects does not afford to involve in the volume that enables customised type of precast columns and beams. Formwork system in the research is ranked (4), (5) and (6) by the respondents.

Furthermore, steel framing system is ranked (6), (7), (9) and (10), and prefabricated timber framing system is ranked (8) and (11). Meanwhile the steel formwork system is yet to gain popularity in Malaysia as the timber formwork is a cheaper option and solution to most construction projects. Finally, blockwork system is ranked (9) and (12) in the research by the respondents. The five current usages of IBS in low cost housing project identified are precast concrete framed building, formwork system, steel framing system, prefabricated timber framing system, and blockwork system.
4.2. Challenges of IBS Usage in Low Cost Housing Project

Figure 2 reveals that the result from the survey conducted, contractors awareness on use of IBS in low cost housing projects. From the findings, contractor’s awareness on use of IBS in low cost housing projects is ranked (1), which means the challenges of IBS usage in low cost housing project should be concern. Lack of IBS knowledge among contractors in low cost housing project in the research is ranked (2), meaning contractors who have acquired the necessary education and training in low cost housing cannot understand IBS design. This makes it difficult to promote the use of IBS into the construction industry. Furthermore, manufacturers are not capable enough to produce adequate facilities of IBS components and inability to utilise the IBS components increases the project cost is ranked (3). Thus, the cost of production of IBS components is a crucial element in low cost housing project. Lack of knowledge in the appropriate technique to be used in jointing the IBS components is ranked (4). Problem of defective joints work of IBS components in the construction is ranked (5). Therefore, to counteract this problem, the developer should thoroughly check and overcome all the defects during handover.

Lack of precise measurements due to design problem of IBS components is ranked (6). These problems arise due to the fact that the parties involved in the construction under estimate the important of accuracy in setting out the alignment and levelling of the bases of components. Specialised skills require onsite for assembly and erection of IBS components is ranked (7), and the high usage of plant and machinery for assembling of IBS components is ranked (8). With the rise of fuel in the world market, the operations of the machinery will somehow burden the constructors’ budget and affect the pricing of the tender bid of the construction projects. Since the cost of the labour are considered cheap in Malaysia, so it is more preferable to use the conventional method rather than IBS and ranked as (13). Lastly, changes in government policies in implementation of IBS are ranked (9) in the research by the responded; this is due to Malaysian government aimed to achieve 100% usage of IBS and to reduce foreign workers in the construction industry.
4.3. Enhancing IBS Usage in Low Cost Housing Project

In general, all respondents strongly agreed that by training of workers on IBS to ensure productivity of its components and establish research and development centre for IBS to bridge the gaps that may be encountered can really improve the utilisation of IBS in low cost housing project as shown in Figure 3. Based on the research findings, the responses analysed have been using mean variables which almost all fall between 4.50 and 3.50 which indicate that all of them are important ways. On the other hand, they ranked more incentives from government to lower the cost of using IBS as less concern. This is good to know that in overall, more incentives from government to lower the cost of using IBS is least preferred ways to improve utilisation of IBS in low cost housing project. It means that, even with various problems faced in improving utilisation of IBS in low cost housing project practitioners still agreed to maintain the requirement of 70% IBS components for each project.

Contractors need to do proper planning and installation to reduce IBS construction cost and manufacturer to register their available components at CIDB. By dividing companies by company sizes, small companies stress on inspection of installation work on the spot to find out mistake earlier. Furthermore, by registering IBS products to CIDB can solve many problems such as standardisation problems and extra cost due to conversion of conventional design into IBS design.
5. CONCLUSION

In conclusion, the current use of IBS precast beam, precast slab, precast column, steel formwork, beam formwork, column formwork and steel column usage is higher than others components. On the other hand, the usage of IBS in low cost housing project in terms of technical knowledge is moderate. The challenges of IBS usage in low cost housing projects in Malaysian construction industry is mainly due to contractors awareness on use of IBS in low cost housing projects, lack of IBS knowledge among contractors in low cost housing project, inability to utilise the IBS components increases the project cost, lack of knowledge in the appropriate technique to be used in jointing the IBS components, problem of defective joints work of IBS components in the construction. The least most influential challenges are specialised skills require onsite for assembly and erection of IBS components, the high usage of plant and machinery for assembling of IBS components and changes in government policies in implementation of IBS. The enhancing ways of IBS usage in low cost housing project does not end when the ways has been decided to pursue and therefore should be transformed into action. There must be a commitment in establishing research and development centre for IBS to bridge the gaps that may be encountered and the training of workers on IBS to ensure productivity of its components were by all the parties should involve. Soft ways such as ensuring provision of standardised sizes and shapes of IBS components and more incentives from government to lower the cost of using IBS usage in low cost housing project is considered least favourable by the respondents. Thus, by improving utilisation of IBS in low cost housing project, its can provide further benefits to construction industry.

REFERENCES


