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COST ISSUE : KEY LIMITING FACTOR THAT AFFECTS IBS APPLICATION IN MALAYSIAN CONSTRUCTION INDUSTRY

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ABSTRACT. In order to achieve the target of being a developing nation in Year 2020, Malaysian government has been investing its efforts in driving the nation to optimize the utility of new, modern and innovative construction methods, including Industrial Building System (IBS), however there are still a number of unresolved issues arisen. Thus, the objectives of this paper are to identify the Cost and Non-cost Factors related to IBS; and further, to justify the significance of Cost Factors in influencing IBS application. Questionnaires were distributed to targeted 44 respondents who consisted of contractors and suppliers. The data were tabulated and further analyzed using Descriptive Statistics and Hypothesis Testing. The findings of the research show the Cost Factors do play significant roles in affecting the extent of IBS application in Malaysian construction industry. Thus, the related parties are needed to look into the possible areas of improving the application of IBS through reducing the rates of design and construction costs.

KEYWORDS: Industrial Building System, Price Factor, Non-price Factor, Design Flexibility and Financial Barrier.

INTI JOURNAL

1. INTRODUCTION

According to research done by CIDB [1] in Year 2007, Malaysian construction industry has generated approximately RM 50 billion output, which also means the industry has created nearly 800,000 construction related jobs for the nation, and thus, it has indirectly produced work opportunities for other industries [2]. However, in order to further enhance the performance of this industry, one of the possible strategies is to scale down the construction costs with Industrial Building System (IBS) application in the construction industry through setting up and implementing certain public policies.

According to Treasury Circular SPP 07/2008 [3], construction projects from public sector should contain at least 70% of IBS components, however contractors from private sectors are forced to pay 0.125% CIDB levy based on the total construction costs, except for those who adopt 50% of IBS components in their housing projects [4].

Although IBS technology has been encouraged by the government to build more quality and affordable low cost houses, this construction approach is not widely applied by most of the small contractors due to inefficiency of small scale projects and also high initial capital investment [5]. For instance, there was only about 15% of construction projects used IBS in year 2003 [6].

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Besides that, there are a lot of barriers that limit the implementation of IBS in construction projects, such as delays, cost overruns, disputes between project team and so on. Thus, the aim of this paper is to identify the main cost issues that limit the implementation of IBS in Malaysian construction industry.

2. LITERATURE REVIEW

This history of implementing IBS technology in construction projects has begun since early Year 1960. It has been recognized by Ministry of Housing and Local Government of Malaysia after they have visited to a few sample construction project in European countries. The first IBS construction project has been built under the 2nd Malayan Plan Year 1960-1965 [7]. Between Year 1966 to 1970, three pilot projects have been completed, such as Pekeiling Flat in Kuala Lumpur, The Rifle Range Flat and Taman Tun Sardon in Penang. Although these projects did face some financial and technical problems, such as higher tendered price [8] and faulty architectural works [9], some recent modern projects were constructed quiet successfully, which include: KLCC Convention Centre, KL Sentral Station, Kuala Lumpur Tower and Kuala Lumpur International Airport.

However, the stakeholders involved in these IBS projects basically have the common perceptions of higher construction cost in IBS projects compared with conventional methods [10]. Thus, this has been discouraged the developers to apply this construction approach in Malaysia [11-12]. Furthermore, Peng et al [13] also proved that there was no significant financial benefits identified in Malaysian IBS projects. In facts, this further link to the root causes that limit IBS application in construction projects, such as lack of involvement of small contractors, limitation in related IBS construction technology and problems of mass construction methods [14].

Among all these key problems, cost related factors are still the factors that influence the decision making process to implement IBS technology in construction projects. Yousre et al [15] has highlighted that higher capital investment cost in IBS compared with conventional method is the primary weakness of IBS. For instance, the contractors are not only required to pay initial payment to clients about 10% to 25% of contract value before work commencement, but they also needs to bear higher initial expenses of ordering prefabricated components [12]. According to Nawi et al [16], the contractors are needed to provide sufficient amount of advance payment to IBS manufacturers to fabricate the precast components before transporting them to construction sites. This is because the supplier themselves also need higher investment capital to provide casting beds and related machineries, and provide training or acquire skillful workers to produce and install the IBS components. Besides that, other cost related factors such as transportation costs from plant to construction sites [17] and construction and operation costs [18-19] also play some significant roles to influence the applicability of IBS components in construction industry.

The cost related factors are then further to be justified whether are still the main factors that limit the IBS application in Malaysia, although significant advancement in technology and implementation of policies have been formed to resolved these issues.

3. RESEARCH METHODOLOGY

Quantitative based questionnaire approach is used to identify the extent of cost factors influence in affecting the usage of IBS. There are 10 related questions were designed to be fitted into the 4 sections of the questionnaire which include: Section A, Respondent Profile (Q1-3); Section B, Views on IBS applicability (Q4-8); Section C, Cost Factors that affects IBS Usage (Q9)

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Vol.2, 2018 (3)

and Section D, Non-cost Factors that affects IBS Usage (Q10). 100 sets of questionnaire were distributed to the construction stakeholders who are G7 contractors and manufacturers within Selangor state of Malaysia. All the questionnaires are sent either through email or Google Driver, and the response rate was 44%.

Although effectiveness of IBS are affected through measurable and numerical based outcomes such as cost reduction, profit margin increment, etc, the subjective feedback and opinions from the respondents onto the preference choices of cost related and non-cost related factors are crucial in succeeding this study. All these subjective data is expressed in Likert Scale with 1 is the lowest and 5 is the highest rating. All data collected was analyzed based Descriptive Statistics, and further in-depth evaluations and justifications were conducted using Hypothesis Analysis.

4. DISCUSSION AND FINDINGS

Based on the findings in Section A as shown in Table 1, most of the respondents are project managers, 22 (50%) followed by technical officers, 9 (21%) and designers, 5 (11%). Most of them 18 (41%) have 5-10 years working experience. This means the respondents are able to provide more comprehensive inputs in comparing conventional and innovative construction methods, and thus, provide appropriate feedbacks to justify the suitability of IBS application in the context of Malaysian construction industry. This statement is further supported by the feedbacks of high frequency usage of IBS in their construction projects in Table 2 which shows about 17 (39%) and 16 (36%) respondents rated often and sometime usage level of IBS components in their construction projects. This shows that IBS construction approach does have some potential for future development in the market, although it is still not yet fully achieve the complete application status.

Table 1 – Background Study of the Respondents

Nature of Job	Frequency	Working Experience	Frequency
Designers	5 (11%)	< 5 years	16 (36%)
Technical Officer	9 (21%)	5 – 10 years	18 (41%)
Project Manager	22 (50%)	11 – 20 years	0 (0%)
Managing Director	3 (7%)	21 – 30 years	8 (18%)
Other	5 (11%)	> 30 years	2 (5%)

Table 2 – Frequency of IBS Usage in Construction Projects

Usage	Never	Rarely	Sometime	Often	Always
Frequency	0	7	16	17	4
Percentage	0%	16%	36%	39%	9%

However, in terms of justification on the effectiveness of IBS construction approach to save construction costs, more than half of the respondents, 25 (57%) are doubtful about the effectiveness of IBS to save construction costs. This may due to the cost related factors as highlighted in the previous section. But, they are aware the problems faced by this construction approach with 73% of them aware compared with 27%, as shown in Table 3 and 4 below respectively.

INTI JOURNAL

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Table 3 – Agreement of IBS to save Construction Costs

Agreement of IBS to save Construction Costs	Yes	No
Frequency	19	25
Percentage	43%	57%

Table 4 – Awareness of IBS Implementation Problems

Awareness of IBS Implementation Problems	Yes	No
Frequency	32	12
Percentage	73%	27%

While the respondents were requested to justify whether cost factors have more significant than non cost factors in influencing the usage of IBS components, most of the respondent, 29 (66%) do agreed that this may due to the statement, as shown in Table 5 below.

Table 5 – IBS Implementation Problems due to Cost Related Factors

Awareness of IBS Implementation Problems	Yes	No
Frequency	29	15
Percentage	66%	34%

Among the cost related factors, high initial capital cost is the highest with Mean value of 4.25, while high salary for skilled worker with Mean value of 2.89 is the lowest rank factor. However, the highest non cost related factor is Inflexibility of Design with Mean value of 3.75 much lower than 4.25 of the highest cost related factor, and the lowest non cost related factor is Limited capacity of existing manufacturer with Mean value of 2.14, which is also lower than the lowest cost factor as shown previously. All the Both mean values and ranking of cost and non-cost factors are listed in Table 6 below:

Table 6 – Mean Values and Ranking of Cost and Non Cost Related Factors

Cost Related Factor	Mean	Rank	Non Cost Related Factor	Mean	Rank
Higher Initial Cost	4.25	1	Inflexibility Design	3.75	1
Higher Overall Construction Cost	4.11	2	Delay in Delivery	2.91	3
Higher Insurance Premium Required	3.59	3	Lack of skill required for site erection / assembly	2.61	4
Expensive Long Distance Transport	3.09	5	Poor integration and interface performance	2.98	2
Reluctance to use High Cost Component	2.93	6	Lack of experience	2.32	6
High Maintenance Cost Required	3.52	4	Lack of appropriate manufacturing techniques	2.59	5
High Salary for Skilled Workers	2.89	7	Limited capacity of existing manufacturers	2.14	7

INTI JOURNAL

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In order to justify the validity of the justification that cost related factors have high significant roles in affecting IBS usage compared with non cost related factors, Student t-statistics with 95% confidence level (two tail test) is used in this research study. Based on the output of analysis, the t-value is 3.93 which is higher than critical value of 2.021, and thus, this means that null hypothesis is rejected, which further justify that Cost Related Factors do have significant impact than Non-cost Related Factors in affecting the IBS usage in Malaysian construction industry.

5. CONCLUSION

In summary, based on the key findings from this study, the cost related factors are proven to have significant impacts in determining the extent of IBS application in construction industry. The major cost factors are mainly related to production costs and investment costs for both manufacturing and training skilled labour. Thus, efforts are needed from the government agencies to setup relevant policies to optimizing the usage and also provide financial and non-financial assistance to the stakeholders to apply this construction method, especially the small scale G7 contractors. Besides that, the contractors and developers are also needed to enhance their project scale and management system in order to improve their economics of scale to sustain their output performance.

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