

## Demand of the industrialized building system (IBS) implementation in Malaysian government projects

D. Mohamad <sup>1,\*</sup>, M.Z. Ramli <sup>1</sup>, Danuri HN. <sup>1</sup>, W.K. Sapuan <sup>2</sup>

<sup>1</sup>*Civil Engineering Department, College of Engineering, University Tenaga Nasional*

<sup>2</sup>*Civil Engineering Department Infrastructure University Kuala Lumpur*

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**Abstract:** Practically, Industrialized Building System (IBS) in Construction Industry has positives outcomes in improving the performance of overall construction work. Through the effort of Construction Industry Development Board (CIDB), promoting the use of Industrialized Building System (IBS) in Malaysian Construction Industry since 1998, it has proven that IBS gives positives effect on that. The Government had indicated earlier that any construction which adopts 70% or more components of the Industrialized Building System (IBS) can be considered as one that has applied the approach of Industrialized Building System (IBS). Nonetheless, the used of IBS for construction projects is still limited compared to what CIDB had been targeting before. Early survey in 2003 reported in IBS Roadmap 2003-2010 (2003) and IBS Survey (2003) indicate that only 15% of overall construction projects in Malaysia used IBS. However, the recent study in 2006 published in IBS Roadmap Review showed that the percentages of completed projects using more than 70% of IBS components in the construction project are in the range of 10%. Thus, this paper aim to measure the level of IBS demands of the Industrialized Building System (IBS) in the construction of government projects. The methodologies adopted for this research are the collection of data from Coordination of Implementation Unit (ICU) and CIDB and survey of the factors that influenced the decision to use IBS. The survey done showed that the important factor that influenced the decisions to use IBS in government projects were reduction in construction time, cost and lack of knowledge regarding IBS system. As the conclusion, the level of IBS system demand in government projects was still low.

**Key words:** Construction; Industrialized building system (IBS); Demand; Time; Cost

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### 1. Introduction

Through the new era of technology, there is much information, knowledge that can be learned and easily allocated around the world. Industrialized Building System (IBS) best defined as process of construction that applied techniques, products, components, or building system in which the components are manufactured in a restricted environment whether it involved with prefabricated components and on-site installation, transported, positioned and assembled into a structure with minimal additional site work. The components are manufactured offsite and once it complete; it will be delivered to construction sites for assembly and erection works (Rahman and Omar, 2006). IBS in Malaysia has started early in year 1960's when Ministry of Housing and Local Government of Malaysia had a trip to several European countries and made an evaluation of their housing development program (Thanoon et al., 2003).

The implementation of precast concept was introduced when the government launched two pilot projects in 1966 for precast housing. The first project was the 17-storey Tunku Abdul Rahman Flats located in Kuala Lumpur consisting of

residential 3000 units. The project adopted the Danish System using large prefabricated industrialized panels. The second project was the Rifle Range Road Flats located in Penang comprised of 3699 residential units and 66 shop lots along the Rifle Range Road (Kadir et al., 2006). These two pilot projects showed that IBS was already being implemented and accepted in constructed industry since a long time ago.

Based on the IBS Roadmap 2003-2010, positive impacts from the fundamental proposal and new government incentives are the industry will choose IBS which guarantees better quality, productivity and safety. This research basically to shows the demand of IBS system in government projects since government was the one who implemented this system in construction industry and to discuss the drivers and barriers for government to implement IBS. This study will gives a better knowledge and information regarding the demand of IBS technologies.

### 2. Problem Statement

Though government had been seriously promoting IBS usage in construction industry through CIDB, however, the percentage of IBS usage was still far away from achieving the ideal objective

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\* Corresponding Author.

that has been understandable in IBS roadmap. IBS Survey 2003 stated only 15 % of construction projects used IBS in Malaysia (IBS Survey, 2003). IBS Mid Term Review in 2007 indicated that approximately only 10% of the complete projects used IBS in the year 2006 as compared to forecasting IBS usage of 50 % in 2006 and 70% in year 2008 as projected in the roadmap (Hamid et al., 2008).

Nowadays, mostly government project done by contractors that had been experienced IBS construction project before was reluctant to used IBS in their next project. They are still willing to use the conventional method. Basically, the member in Construction Industry are open to the idea of adoption of IBS system, however, a huge portion of the industry stakeholders are indifferent, perhaps because of the resistance towards change (Hamid et al., 2008).

IBS start been introduced in Malaysia in order to deal with a growing demands for affordable housing, increased of construction cost, lower productivity rate, solving problems regarding foreign workers and definitely to improve the image, quality and productivity of construction related to services. Selangor was the first state in Malaysia that would advance in the concept of prefabricated affordable housing to fulfill the demand of homes needed by the society from low-income group. Therefore, the limitation of IBS demand in Government Projects has leded this paper to identify the drivers and barriers to the problems arise and seek for a better solution forward.

### 3. Literature review

As the implementation of IBS technologies had been seriously promoted by CIDB nonetheless, the government of Malaysia still feels that the usage of IBS is still low despite potential advantages. From the survey conducted by CIDB of Malaysia in 2003, the usage level of IBS in local construction industry stands at only 15% (IBS Survey, 2003). Despite all the advantages and support from the government, early effort to promote usage of IBS in Malaysian construction industry is still very low compared to conventional methods.

Other studies also support the conclusion that the usage of IBS technologies in Government project still low. Kamarul Anuar Mohamad Kamar, Mustafa Alshawi and Zuhairi Abd Hamid (2009), conclude that the implementation of IBS still far from expectation was due to the various reasons. Research paper with the tittle "The Barriers to Industrialized Building Systems: The Case of Malaysia", paper proceedings in BuHu 9th International Postgraduate Research Conference (IPGRC, 2009), The University of Salford, 29 - 30th January, 2009, Salford, United Kingdom has stated that although members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change, insufficient information and lack of technology transfer methods to support

feasibility of change to IBS contributing to the lower usage of IBS technologies in Government projects.

The paper reviews literatures conserving barriers on implementing IBS in Malaysia which requires attention from different parties. They demonstrate that there were plenty of barriers to IBS Implementation in Malaysia had been known through the previous research. It's proven that the need for adopting IBS system in Malaysia construction Industry was plausible due to the strong encouragement from the government especially in placed. They however, one of the barriers that had been identified as being potential hurdles to the implementation is readiness.

The transformation is not green a good respond due to the unlikely construction readiness (Hamid et al., 2008). Local workforce is reluctant to join the industry because of the issues of low wages combined with low emphasis on occupational safety and health. The current training program to produce new construction workforce is still not be able to cater vast demand of the market. As such, regardless of foreign worker policy, foreign labor to do manual job is still badly needed by the industry and it is available abundant in cheaper cost (Construction Industry Master Plan, 2007).

Next, due to cost issues; they show that, many small contractors are reluctant to adopt IBS system and prefer to continue using the conventional method of construction. This is due to the fact that small contractors are already familiar with the conventional system and for them the technology suit well with small scale projects and therefore not willing to switch to mechanized based system. Furthermore small contractors lack financial backup and are not able to set up their own manufacturing plants as it involves very intensive capital investment. In this case, financial issues become the main obstacle for small contractors to move forward with the IBS system (Rahman and Omar, 2006).

Additionally, from the research done by Izatul laili Jabar, Faridah Ismail, Arniatul Aiza Mustafa on the Issues in Managing Construction Phase of IBS Projects discuss on the issues that arise in managing construction phase of IBS project; this research also done to know why the implementation of IBS still far from expected. There are several issues in managing IBS construction projects which lead to delays, poor qualities and cost overrun. The paper aims was to analyze the issues in managing the construction phase of IBS projects that reflects IBS as a non-efficient implementation. The most significant challenge to the adoption of IBS is higher capital cost (CIDB, 2010; Pan et al., 2004; Pan et al., 2007; Blismas and Wakefield, 2009).

Insufficient knowledge also contributing to the issues of IBS implementation thus, its led to improper assembly due to difficulties during installation; both of the research was quite similar with the purposes of recent study of mine however the focus on the research was more towards the barriers only and also in terms of management.

Recent study on 2014 by Taksiah A. Majid, Mohamed Nor Azhari Azman, Shaharudin Zaini and Mohd Sanusi stated that based on the T-test analysis done through their research shows that all the class of contractor consists of contractor G7, G6, G5 and G4 have the same correspondence on the awareness and the actual use of IBS but having significant difference in opinion on IBS actual use which were the problems faced when using IBS and promotion of IBS by the government through CIDB and perceived IBS usefulness. This research only focusing on projects which mainly building construction only and using questionnaire design and quantitative questionnaire survey. Their respondents were basically in terms of contractor perception differing from my research that focused on people who work in Government Agency.

It is acknowledged that the importance of this research is to know how much the percentage of IBS usage in Government project as the technologies itself had been introduced by government in order to solved construction problem. In this context also, from the questionnaire done to survey government people opinion regarding the reasons why they are implement or not to implement IBS system in each of government projects.

### 3.1. IBS in Malaysia

IBS in Malaysia has been established, introduced and applied in construction industry in order to deal with a growing demand for affordable housing, increased of construction cost, lower production rate, solving issues associated with foreign workers and improving quality, efficiency and productivity of construction industry.

Despite all the advantages and support from the government, early effort to promote usage of IBS in Malaysian construction industry is still very low compared to conventional methods. Other studies also support the conclusion that the usage of IBS technologies in Government project still low. Kamarul et al. (2009), conclude that the implementation of IBS still far from expectation was

due to the various reasons. Though advantages and systematic implementation plan that already established through the IBS roadmap, there were still numbers of barriers were identified as being potential to gives challenge to the implementation of IBS. According to Kamarul et al. (2010), from the pilot study, the result summarized that the barriers to use IBS in construction were higher cost and also high capital investment.

According to IBS Roadmap Review (CIDB, 2007) report, the successful factor of adoption of IBS in Malaysia is a client driven. Client with a good knowledge and awareness of IBS benefit will surely encourage appointed designers to design building according to IBS. Unfortunately, lack of awareness program to understand client needs and giving correct information on IBS has contributing to a lack of interest from the client and decision makers (Rahman et al., 2006).

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### 3.2. Status of IBS implementation In Selangor

The percentage of IBS project in Selangor was from the data collected at Coordination of Implementation Unit (ICU). Table 1 illustrate that Ministry of Education has the highest number of construction and IBS projects which are 171 and 84 projects. Followed by Ministry of Health (18), ICU (15) and Ministry Home Affairs got 8 construction projects and 4 of them were IBS projects. The overall percentage of IBS projects in Selangor for the past 4 years was 49% and projects does not implement IBS was 51%.

**Table 1:** Below shows the number of construction projects and IBS projects in Selangor

No	Ministry	Number of construction projects	Number of IBS Projects	Percentage of IBS Project
1	Coordination of Implementation Unit (ICU)	15	1	7%
2	Ministry of Youth and Sports	2	2	100%
3	Ministry of Home Affairs	8	4	50%
4	Ministry of Rural and Regional Development	7	3	43%
5	Ministry of Works	2	1	50%
6	Ministry of Local Government and Housing	2	2	100%
7	Ministry of Health	18	13	72%
8	Ministry of Finance	4	1	25%
9	Ministry of Women, Family and Community Development	1	1	100%
10	Ministry of Education	171	84	49%
11	Ministry of Higher Education	1	1	100%
12	Ministry of Human Resources	1	1	100%
	Total	232	114	49%

(Source: Coordination of Implementation Unit (ICU))

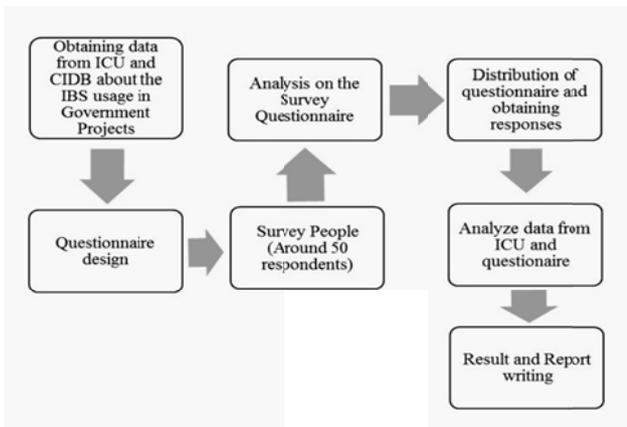
## 4. Methodology

This paper has been using two types of data. The first one was secondary data collected from Coordination of Implementation Unit (ICU) and Construction of Development Board (CIDB) to determine the percentage of IBS projects. The second data was a survey method by emphasize of questionnaire survey. The distribution of questionnaire is an approach to elicited information on the respondent's previous completed project in respondent's perception on the drivers and barriers in the use of IBS in government project. Survey sample consist of Board of Director (BOD), three different level of management which are Top Managers (Executives), Middle Managers (Plant, Division and Staff Managers) and First Line Managers (Supervisors, Foremen and Department Heads) that involved directly in the direction of construction industry.

This paper has been divided into several parts. The first parts study the current status of IBS implementation in Selangor through percentage of IBS usage in government projects. The second part is to identify the drivers and barriers of IBS implementation using survey done to people who work at Government Agencies at Selangor; next, the analysis of data from ICU, CIDB and also statistical analysis for survey method using SPSS software. Last part is result and report writing to conclude and gives recommendation.

**4.1. Research structure**

For a proper understanding of the survey result on IBS usage, a flow chart was constructed in order to make this IBS survey activities manageable (Fig. 1). This flow chart shows how the analysis done.



**Fig. 1:** Research structure flow chart

**Table 2:** The percentage of IBS in Selangor

Sources	Coordination of implementation Unit (ICU)	Construction of Development Board (CIDB)
Number of project IBS	49% (114 Projects)	24.4% (136 Projects)
Number of project without IBS	51% ( 118 projects)	54% (216 Projects)

(Sources: Data from SPP II, ICU and CIDB)

In concept of experiences, 45.7% of the respondents have more than 10 years experiences in the construction industry and 22.4% have 2 – 4

**5. 5. Result analysis and discussion**

The result of the data analysis will be discussed thoroughly and are presented. The data were collected and then analyzed in response to the problems arises in previous chapter of this disquisition. Two fundamental objectives drove the collection of all the data and continue with the data analysis. Those objectives were to identify the percentage of IBS usage in Government projects and to determine the drives and barriers to implement IBS system. The two objectives were accomplished and the findings will be presented in this chapter showing the potential for the combination of theory and practical knowledge.

**5.1. Current Status of IBS Implementation for Government Projects.**

From Table 2 shows the information on the number of IBS projects by Government Agencies from year 2011 until 2014. The overall percentage of IBS adoption in Government projects is at 24.4% and 49%. The data from Project Monitoring System II (SPP II) and Coordination of Implementation Unit (ICU) showed that from year 2011 until 2014, there were 557 and 232 building projects (valued at more than RM10 million each) were built. Overall cost of the project is valued at RM33.1 billion. From the total projects, 136 projects (24.4%) with overall cost of RM8.5 million and 114 projects (49%) was built using the IBS system and exceeded the minimum target of 70% score.

**5.2. The most important factors to implement IBS**

Based on past experienced, respondents were asked to identify the driver and barriers in IBS implementation. A total of 386 questionnaires were sent through emails and 71 responses for this survey. The response rate is 18.4%. IPTA and Public work Department have given good feedback to the IBS survey. Out of the total respondents (47.9%) consisted of front-line managers, (32.4%) middle manager, followed by (18.3%) Top management and (1.4%) from Board of Director (BOD) which is beneficial for an opinion survey analysis.

years of experiences in handling IBS projects. This showed that all respondents are qualified and suitable to answer the survey questions.

Table 3 and 4 shows the respondents' view regarding the drivers and barriers to use IBS system in government projects based on a five-point Likert scale (1 – strongly disagree, 2 – agree, 3 – nor agree nor disagree, 4 – agree, and 5 – strongly agree). Based on the analysis done using SPSS software, the mean value for all factors indicated in this survey were more than 3.0, which means all the drivers listed are giving impact to the decision to implement IBS (Kamarul et al., 2009). Commitment from Board

of Director/Top management is the most important factor that determines the use of IBS, followed by the reduction of construction building time. Lack of knowledge regarding IBS system was the most significant barriers that prevent the implementation of IBS in government projects. The results of this survey will provide idea of the perception of people who work in government agency towards IBS implementation.

**Table 3:** Mean value of Drivers to Implement IBS

Descriptive	Statistic N	Mean
Commitment from the Board of Director/Top Management is the most important factor that determines the use of IBS.	70	4.34
The reduction of construction building time is one of the key successful drivers to use IBS.	70	4.24
Usage of standardized IBS components and simplified construction process enables the faster completion of public building projects.	70	4.21
Early decision to use IBS can lead to the use of IBS system in construction of government project	70	4.03
The number of labor force required in IBS is considerably lower can address skilled workers shortage problems in government construction.	70	3.99
Valid N (list wise)	70	

**Table 4:** Mean value of barriers to implement IBS

Descriptive Statistic	N	Mean
Lack of Knowledge	70	3.71
Skill workforce shortage	70	3.67
Low manufacturing capacity	70	3.63
Cost	70	3.61
Instruction from superior	70	3.53
Conflict in design	70	3.39
Building Regulation/Standard	70	3.33
Risk	70	3.33
Demand from Contractor	70	3.29
Valid N (list wise)	70	

**6. Conclusion**

With relates to this current study, it is proved that IBS gives a lot of benefit towards the successful of construction industry. IBS improves the quality, efficiency and the production of the factory-made products.

The study of the IBS status in Selangor was successfully carried out from 2011 until 2014. The percentage of technologies usage in government projects was determined from data collected from ICU and CIDB. The level of IBS demand in the construction of government projects was still low even though government has seriously promoting and encouraged the use of IBS in order to have a better practice in construction industry. Analysis of the demand of IBS shows that overall, the implementation of IBS is still not satisfactory due to the certain Government projects that have been permitted to the exclusion in the implementation of IBS as established in 1Pekeliling Treasury (1PP) PK 1/2013. The exception is for the projects to be implemented in rural areas that are inaccessible by land transport as well as renovation of existing buildings and does not involve the construction of new buildings. Nonetheless, to have changes in

construction method from conventional to the practice of IBS is somehow indeed a difficult task.

The statistical analysis from survey showed that most of the respondent from various government agencies agreed that the important factors that influenced the decisions to adopt IBS were commitment and decision to use IBS from Board of Director/Top management and also lack of knowledge or information regarding IBS system. The survey reveals that the factors responsible for the constraint toward IBS implementation in government projects are infrequent solely technical in the beginning. They are more close to the organizational strategy to successfully implement IBS. As for the conclusion, the objectives of this research were successfully achieved.

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