THE ACCEPTANCE LEVEL OF INDUSTRIALISED BUILDING SYSTEM (IBS) IMPLEMENTATION IN SARAWAK

Dyg. Siti Quraisyah Bt. Abg. Adenan[1] and Wan Azri B. Wan Abu Bakar[2]
[1] Research Associate, I-Geo Disaster Research Centre
[1,2]Department of Civil Engineering, Faculty of Engineering and Technology Infrastructure, Infrastructure University Kuala Lumpur (IUKL)

ABSTRACT
The primary purpose of this research is to investigate the extent to which construction companies in the state of Sarawak accept the technology of Industrialised Building System (IBS) in their projects. In Sarawak`s case, it is a new technology which is expected to reign in most projects. Many experts in the field of construction theorised that the invention of IBS and its implementation as enhancing the quality of construction not only in terms of workmanship, but also time and costs, particularly suitable for a rapidly developing state like Sarawak. As an interpretive orientated study, this research had an interest in understanding the level of acceptance towards IBS as well as the general perception of the technology. As it is, this study sought to investigate the level of acceptance regarding IBS in Sarawak`s current economic climate. The findings of this study suggest that IBS technology has been embraced by local construction companies to a certain extent. There are potentially positive aspects that have been brought by contractors, namely, openness to implement the technology in future designs. However, the study has depicted a lack of extensive knowledge on the side of some contractors and this hinders the acceptance of IBS technology. The study has also revealed that there are challenges facing contractors in terms of trying to implement the IBS in Sarawak. Challenges such as the poor availability of material and logistics are a big issue that influence the level of acceptance of IBS among contractors.

Keywords:
Acceptance, Construction Industry, Industrialised Building System (IBS), Sarawak.

INTRODUCTION

Industrialised Building System (IBS) was defined as "a total integration of all subsystems and components into an overall process fully utilising industrialised production, transportation and assembly methods" (Zuhairi, 2011). The implementation of Industrialised Building System (IBS) in constructions promised to make construction phase of a project more efficient. IBS has been introduced in Malaysia since the early 1960s when the Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program (Thanoon et al., 2003).

After their successful visit in 1964, the government had started the first project on IBS, just a year later aims to speed up the delivery time and built affordable and quality houses. 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. It consists of precast component systems, fabricated steel structures, innovative mould systems, modular block systems and prefabricated timber structures as construction components (CIDB, 2003).

In theory, the utilisation of precast components would lead to reduced construction time, less material wastage, cleaner and safer site, and a higher-quality build. This study will discuss on the issue of acceptance level of construction players in east Malaysia, specifically Sarawak, toward IBS. The reason is to see the factors or barriers of implementing IBS and the

reason of it not being fully utilised in Sarawak. In terms of project management, IBS promised reduction in the overall construction period, a more fixed costs in terms of materials, and a cleaner site (Aziz, 2012).

However, even after five decades of introduction, it appears that the level of acceptance towards IBS in Malaysia is still low compared to that of other developed countries such as Japan, UK, Australia and US. It is a loss for the local construction industry players as IBS offers obvious benefits such as reduced construction time, minimised use of timber form works on site, enhanced quality of buildings, reduced number of workers on site, and decreased air pollution which would definitely exert a major impact on the industry productivity, quality, health and safety, and the environment (Kamarul Anuar, 2009).

According to (Yahya & Safwan, 2012), two specific questions were addressed for guiding the study. Firstly, why has IBS technology not been fully accepted in the Malaysian construction industry. Secondly, what are the risks involved in selecting IBS in construction projects. The results in this study supported the hypothesis that IBS has not been fully accepted in some quarters of the local construction industry. In general, 50% of the parties involved quoted that the implementation of IBS reduced profit margins as to the conventional method, where the 30% suggested that lack of availability of material that discouraged them from using the technology and the 20% argued that lack of skilled labours and knowledge of the newly introduced system, especially in the developing regions of East Malaysia.

Problem Statement

Since the early 1960`s, Malaysia has adopted the technology of Industrialised Building System (IBS) in its construction industry (Nur Hazreeni, 2010). Even though the progress made since then was slow and gradual, the majority of those progress were focused on the West or Peninsular Malaysia compared to East Malaysia which are the states of Sabah and Sarawak due to the fact that development was rapid surrounding the capital state and other neighbouring states within the region. As for Sarawak, a slowly developing economy led to a more controlled growth by using safer and more traditional ways to prevent unnecessary risks to be taken that could stunt the economic growth. For this very reason, the construction industry in Sarawak didn't embrace the idea of a new technology that promised to make the industry more efficient. It was seen as an unnecessary risk that without full understanding may lead to unwanted and unforeseen problems even though many of the construction players and researchers in the industry stated that IBS will help the construction phase towards greater concentration on achieving a better construction which meets the needs of the client rather than the conventional method which contributes to wastage.

In lieu of the unexpected level of acceptance towards IBS in Sarawak, this paper wishes to look at the nature of the problem and the factors that contributed towards the level of acceptance of IBS.

Objectives

The objectives for this study are shown as follows:

i. To assess the overall level of acceptance regarding IBS in Sarawak.
ii. To identify the factors contributing to the level of acceptance towards IBS in Sarawak, Malaysia.
iii. To identify the future outlook of IBS technology in Sarawak.

METHODOLOGY

The first step in this study is identifying the research problems and the formulation of objectives to be achieved regarding the identified problems. Then, the scope of work can be determined as well as starting with secondary sources such as books, articles, thesis and dissertations, and journals for detailed references, and followed by primary data collection (interviews and questionnaire surveys) and data analysis, and finally with the formulation of conclusion and report writing. The flow chart of the methodology for this research study is shown in Figure 1.

The questionnaire is a set of pre-formulated and written questions that the researchers would like to ask for respondents and record their given answers. The questionnaire can be an efficient data collection tool when the researcher knows exactly on the information that is required and how to measure the variables of interest. All questions should be clear, understandable and unambiguous. Data validation will be after the questionnaires had been collected and in the process of validating the data, the answers obtained from the questionnaires will be checked for accuracy and relevancy with the research objectives. Respondents to the questionnaire in this study focus on contractors, consultants, and suppliers only. It was designed to gather information which is unavailable from literature reviews.

All the data acquired will be analysed using software such as Microsoft Excel. Two statistical methods will be applied in the study, which are descriptive statistic and inferential statistics. The data generated from the question was first analysed by using frequency analysis. The data were then analysed using Reliability Index (RI) for the questions which uses an ordinal scale of 1 to 5 (in descending order).

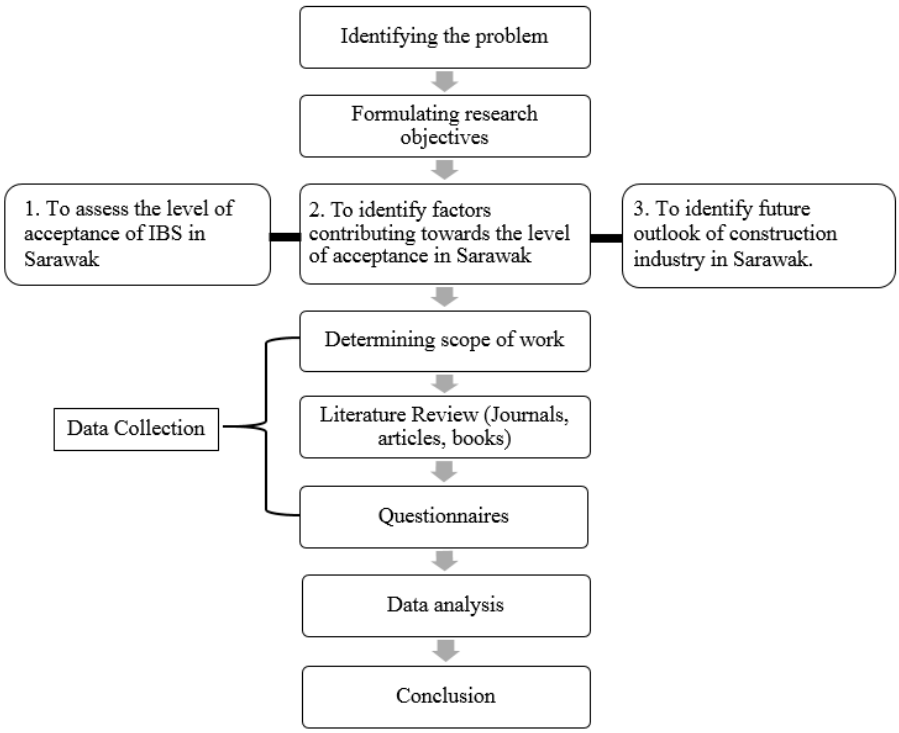

Figure 1: Flowchart of Research Methodology

DATA AND ANALYSIS

Table 1 indicates the respondents` background. Based on the survey, 43 respondents were individuals working in a Class A contractors, while 35 respondents were individuals working in consultancy firms whereas 2 respondents were working in IBS supplier companies. For the subjects, 70% of respondents were males, and 30% of the remaining respondents were females. Amongst 80 respondents, 37.5% were aged between 31-40 years old, whereas respondents of age under 30 years old, cover 45% of all the respondents which is the largest group. The two smallest age groups in for this survey are the 41-50 years old group at 10% and above 51 years old at 7.5%.

Table 1: Respondents` Demographic

Background	Frequency	Percentage
Contractors	43	53.75%
Contractors	35	43.75%
Suppliers	2	2.5%
Gender	Frequency	Percentage
Male	56	70%
Female	24	30%
Working Experience	Frequency	Percentage
< 3 Years	5	6.25%
3-5 Years	19	23.75%

Respondents were asked to give their opinions on a scale of 1 to 5 as stated in Table 2. Scale 1 being “strongly disagree and scale 5 being “strongly agree” based on criteria such as costs, speed, ease of use, quality, and other factors as a gauge to determine the level of acceptance towards IBS technology in the construction industry of Sarawak.

Table 2: Likert Scale

Scale	Scale
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

The rating given by respondents were summed and analysed, and the results acquired are as shown in Table 3. From the results shown in the Table 3, for the first factor which is the high construction cost of IBS, roughly 44% of respondents surveyed agreed that it is expensive, whereas 36.25% of the respondents were neutral in their opinion on the matter. Only 6.25% of the overall respondents disagree with IBS is expensive in terms of construction.

From the results shown, in terms of costs, the majority of the respondents generally agreed that IBS implementation in Sarawak is costly in terms of construction and transportation of the materials. It is, however, the respondents generally disagree that IBS technology is expensive, mainly because of high labour and maintenance cost if implemented.

Table 3: Respondents` Opinion Regarding Cost

Criteria (Cost)	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
High construction cost	1.25%	5%	36.25%	43.75%	13.75%
High transportation cost	0%	15%	28.75%	48.75%	7.5%
High labour cost	22.5%	42.5%	16.25%	15%	3.75%
High maintenance cost	6.25%	22.5%	46.25%	17.5%	7.5%

According to Table 4, 73.75% of the respondents agreed that implementing IBS construction is faster than traditional construction method, whereas 5% of the respondents disagree that IBS implementation does not reduce construction time. They argued that the reduced construction time of IBS may be substituted by production time and transportation time in certain cases.

For ease of construction, the majority of the respondents (55% strongly agree followed by 37.5% whom agree) does think that by using IBS, not only the construction is easier, but also for individual components, installation and assembly is easier than to construct from start. No respondent`s disagree with the fact that IBS is easier to construct and easier to implement in the overall project rather than the traditional methods.

The third criteria is flexibility of design, with the largest group indecisive in their opinion on the matter by 37.5%. The second largest group with 31.25% agreed that IBS is flexible in terms of design, followed by 12.5% of the respondents who strongly agreed with this sentiment. The majority of the respondents being neutral in this matter may be a slight indicator of the lack of expert knowledge regarding IBS.

Based on less site material criteria, a total of 16.25% for the whole group strongly agreed that IBS implementation produced less materials in construction sites, with the majority of the group at 77.5% agreeing to this. The smallest group is neutral at 6.25% with no respondents disagreeing with this criteria.

The next criteria for construction is minimal wastage, not to be confused with the previous criteria “less site materials” where minimal wastage is by-products from the installation or implementation of IBS where the latter is, in other terms, is more to storage on site. 69 (86.25%) out of 80 respondents agreed that IBS implementation reduces wastage on site as it is precast. 7 individual (8.75%) strongly agreed with this criteria, with the small group of 5%

is neutral and no respondents surveyed disagree with this criteria regarding IBS implementation. One of the key advantages of using IBS is that it has minimal wastage. This indicates that most of the contractors or consultants surveyed know about IBS and understand this benefit.

The majority of the respondents (70%) agrees that basically IBS implementation creates a safer construction site. This is based on the idea that IBS is a precast system that correlates to the cleanliness of the construction site. Without in-situ casting, sites can be cleaner and safer. According to the data presented, 40% of the respondents disagree and strongly disagree that the barriers to IBS implementation is because of difficulty in obtaining advanced machinery despite 12.5% strongly agree, 25% agree with that notion and with 22.5% of the respondents surveyed were neutral regarding these criteria.

Table 4: Respondents` Opinion Regarding Design

Criteria (Construction)	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
Rapid completion time	0%	5%	18.75%	73.75%	2.5%
Ease of construction	0%	0%	7.5%	37.5%	55%
Flexibility of design	0%	18.75%	37.5%	31.25%	12.5%
Less site materials	0%	0%	6.25%	77.5%	16.25%
Minimal wastage	0%	0%	5%	86.25%	8.75%
Clean & safe construction site	0%	0%	13.75%	70%	16.25%
Difficulty in obtaining advanced machinery	10%	30%	22.5%	25%	12.5%

CONCLUSION

The conclusions are based on the three (3) objectives of this study:

i. **To assess the overall level of acceptance regarding IBS in Sarawak.**
   After all the research on the internet, libraries, books and surveys, it can be concluded that the level of acceptance towards IBS in the state of Sarawak is at a satisfactory level (CIDB, 2013). The awareness is already established regarding the technology, but implementation is steadily increasing as more and more developers understand and try to look for an opportunity to implement IBS in their design.

ii. **To identify the factors contributing to the level of acceptance towards IBS in Sarawak, Malaysia.**
   The results clearly demonstrate that most contractors in Sarawak are unwilling to take new risks in that may affect their business is one of the main factors that influence the acceptance of implementing IBS. As being the largest state in the country, the distance to be covered are greater thus increasing the transportation costs, also indirectly affects the time of delivery and construction. Even though the advantages of IBS implementation may be clear to the industry`s communities, but the "Play-safe" attitude and costs are the drawback in accepting IBS in Sarawak as of current time.

iii. To identify the future outlook of IBS technology in Sarawak.
Awareness and knowledge are keys to increase the level of acceptance regarding IBS in Sarawak. Based on the survey done, the future of IBS technology in Sarawak looks bright as the state`s construction industry, as well as the country`s construction industry as a whole, is increasingly aware of the system and demands are increasing as stated by CIDB (CIDB, 2011).

This paper has briefly reviewed the knowledge of the contractor and the general level of acceptance on IBS in Sarawak. There are strong suggestions by the contractors to implement IBS systems in future construction projects in the state. To promote and adopt the IBS in Sarawak`s construction industry, it is a never ending effort and it requires serious participation from all parties involved in the construction industry.

RECOMMENDATION

Further study should be conducted to overview the implementation of IBS for construction in Sarawak. In addition, the survey also must take into account of other parties involved in the construction industry such as the local authority and also the clients to better understand their knowledge and determine their acceptance of the IBS system more accurately.

ACKNOWLEDGEMENTS

The author of this research paper would like to thank the Department of Civil Engineering, Faculty of Engineering and Technology Infrastructure, Infrastructure University Kuala Lumpur for the support and also guidance in successfully conducting this research.

REFERENCES

Aziz, S. A. (2012). The Application of Industrialised Building System in Residential Project. Faculty of Civil Engineering & Earth Resources. UMP, Pahang, Malaysia.

CIDB, I. R. (2003). Survey on the Usage of Industrialised Building System (IBS) in Malaysia Construction Industry. *Construction Industry Development Board (CIDB)*(ISBN No: 1675-6991).

Kamarul Anuar, M. A. (2009). Barriers to Industrialised Building Systems: The Case of Malaysia. *BuHu 9th International Postgraduate Research Conference (IPGRC 2009).* Salford, United Kingdom.

Nur Hazreeni, M. N. (2010). A Study on the Acceptance of IBS in Construction Industry in Kelantan: Application of Logistic Regression Analysis. *Regional Conference on Statistical Sciences.*

Thanoon, W., Peng, L., Abdul Kadir, M., Jaafar, M., & Salit, M. (2003). The experiences of Malaysia and Other Countries in Industrial Building System in Malaysia. *IBS Seminar, UPM, Malaysia*.

Yahya, M. A., & Safwan, M. N. (2012). Level of Acceptance Towards Industrialised Building System (IBS) in Malaysia. *International Journal of Sustainable Construction Engineering & Technology, Vol. 3,* Issue 1.

Zuhairi, K. A. (2011). Industrialised Building System (IBS): Revisiting Issues of Definition and Classification. *International Journal of Emerging Science and Engineering*.