

THE READINESS AND CHALLENGES IN THE INDUSTRIALISED BUILDING SYSTEM (IBS) ADOPTION IN SARAWAK FROM G7 CONTRACTORS' PERSPECTIVE

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ABSTRACT

Industrialised Building System (IBS) is defined as method for thorough integration of subsystems, components, and parts into a single overall system that utilizes industrialised manufacturing, transportation, assembling, and erection on site. Buildings that are built by using IBS method have many benefits, including high quality, low cost, fast construction, high flexibility, minimal wastage, and less environmental impact. However, adopting IBS in Sarawak has several hindrances such as logistical situation in rural Sarawak and the overpriced IBS adoption due to lack of manufacturer in the areas which causes lack of readiness among contractors. Thus, the aim of this research is to identify the G7 contractors' readiness and investigate the challenges of IBS adoption for construction in Sarawak. One hundred and twenty-five sets of questionnaire surveys were distributed to G7 contractors in Kuching area by using google form as online medium and were analysed using SPSS version 26 software. The findings from the survey showed that Sarawak G7 contractors still lack readiness in IBS adoption



due to challenges faced. Thus, further research needed on steps to be taken to reduce challenges in adopting IBS in Sarawak.

Keywords: *IBS, adoption, readiness, challenges, Sarawak*

INTRODUCTION

Construction is one of the main economic industries in Malaysia (Dehdasht et al., 2021). This sector nowadays is more progressive, modernised, efficient, and well-equipped, allowing construction companies to expand into the execution of complex and large infrastructure projects employing cutting-edge technology. The Industrialised Building System (IBS) has been introduced to improve the industry in Malaysia. According to Rahman and Omar (2006), the adoption of IBS could push construction industry from any level to a new level of professionalism and success.

An industrialized building system (IBS) is a construction method that uses on-site and off-site (factory manufactured method) prefabrication to improve construction efficiency (Delfani et al., 2016). It offers plenty of benefits that helps in construction efficiency such as high quality, relatively low costs, quick construction, high flexibility, minimal waste, and great environmental performance (Luo et al., 2015).

Even though plenty of benefits can be achieved by adopting Industrialised Building System (IBS) method, there is still lacking in term of readiness in adopting this method in Sarawak. As stated by Datuk Seri Dr. Sim Kui Hian (cited by Louis, 2020) it seems in Sarawak, constructors are not yet prepared to fully participate in the Industrialised Building System (IBS). Although, the majority of the contractors agreed that IBS would improve project delivery, the biggest obstacle to IBS deployment in Sarawak is the lack of sufficient volume to use it economically (Bohari et al., 2012).

LITERATURE REVIEW

Construction Industry Overview

The construction industry is an activity concerning construction, alteration, repair and maintenance work. Dehdasht et al. (2021) stated that construction industry develops other industries by providing necessary facilities through making use of socioeconomic infrastructure. It is an important industry which helps to improve any countries' economic and is considered as a key economic sector in Malaysia and is seen as one of the nation's economic growth indicators (Construction Industry Development Board (CIDB), 2021). The construction industry is assumed to be a significant role in wealth generation and life quality enhancement through social and economic infrastructures and buildings implemented by the government socioeconomic programs (Dwikojuliardi, 2016). Ibrahim et al (2010) stated that construction industry is a crucial industry in Malaysia as it offers economic and social benefits due to industrial production and reproduction.

Yet, construction industry in Malaysia is seen to be low and slow in nature. This industry is also linked to problems involving post contract design changes, cost overruns, delay in completion, competitive tendering process, and payment issues (Yap, Chow & Shavarebi, 2019). In addition, design change in construction industry is seen to be a significant factor for time delays and cost overruns (Muhamad and Mohammad, 2018). It is estimated that the Malaysia construction industry will have a slower growth next year due to various mega projects revision in the country (Shah and Iskandar, 2023). Thus, solution is needed to improve the industry.

Hence, the adoption of Industrialized building system or IBS is recommended. For many years, the Construction Industry Development Board (CIDB) has worked relentlessly to encourage the application of IBS in the construction industry (Abdullah et al., 2021). IBS is defined by some academics as a method of comprehensive integration of subsystems, components, and parts into a single overall system that makes use of industrialised manufacturing, transportation, assembly, and erection on site (Nasrun et al., 2010). Many benefits of IBS adoption towards the

construction industry that can be identified as stated by CIDB Malaysia (2012), which are improving building quality and productivity, decreasing occupational safety and health concerns, addressing difficulties with skilled employees, reducing reliance on manual foreign labour, and ultimately lowering the total construction costs.

Despite the benefits and all the attempts in promoting IBS, adoption in private sector development industry for IBS remains low at 40% (Construction Industry Development Board (CIDB), 2021). Thus, the need for this research to be executed.

Readiness of IBS adoption in Sarawak

Various researchers have published studies on the variables that influence how the IBS project was implemented in Malaysia (Tamrin et al., 2016). According to Nawi et al., (2019), to increase the adoption of IBS, a number of obstacles have been encountered, and the majority of these challenges arise from readiness issues. Datuk Seri Dr. Sim Kui Hian stated that Sarawak is not yet prepared to fully participate in the Industrialised Building System (IBS), which includes projects with a value greater than RM50 million (Louis, 2020).

Personal experiences in implementing IBS do affect the readiness to adopt the system. According to Mohamad et al. (2009), a person with a high level of personal experience is more ready for the adoption of IBS, both mentally and technically. The vast majority of Malaysian contractors have very poor understanding and experience in managing the construction of IBS systems (Mohd Fateh et al., 2016). Local professionals and contractors technical knowledge and experience in operating IBS are still at a minimal stage (Nawi et al., 2019). This too has influenced the decision to incorporate iBS among the contractors.

Other than that, awareness in IBS system affects the awareness of adopting IBS. In order to increase IBS projects in Malaysia, the government should pay special attention to encourage IBS adoption. Despite the encouragement, Mohamad et al. (2009) stated that the awareness and acceptance for the current IBS adoption did not cover all the elements of the IBS adoption process, and not all practitioners were able to accept its

adoption, particularly companies, and personnel with less experience in managing IBS projects. Thus, stakeholders should increase their awareness about IBS that has been implemented in MCI, through various short courses in order to support the IBS adoption.

Financial issues (or payment) do affect the readiness to adopt IBS. Payments which referred to as monies that is used in paying for material, labour, plant, account of subcontractors, preliminaries and general overheads expended for the projects' progress (Ishak, Alauddin & Ibrahim, 2019). Due to the fact that the methods for progress payments on an IBS project are different from the conventional practice (Nawi et al., 2019). In the standard practice, the client will make an initial payment to the awarded contractor equal to around 25% of the total price of the project prior to the project getting underway (Nasrun et al., 2010). When it comes to IBS project, the vast majority of clients make payments after they have seen the results of the work, but the contractor is responsible for making payments to the manufacturer before getting paid (Nawi et al., 2019). According to Hadi et al. (2017), when off-site casting is used, contractors will not receive any compensation from the employer until the IBS components are delivered to the construction site, though payments must be given to the manufacturer once the components are casted. Because of the lack of sufficient funds and inconsistency in providing money or capital to projects (Hadi et al., 2017), it is difficult to "roll" the money for smaller companies (Nawi et al., 2019).

The readiness of construction players to change from conventional to IBS practices is important, given that IBS is regarded as a new method in the building industry (Nawi et al., 2019). In Tamrin et al. (2016) research, the industry stakeholders must be ready to undergo the changes to achieve the government's objective to change the construction sector from the conventional method to the IBS method.

It was observed that small contractors lack the financial backing and are unable to establish their own production facilities because doing so requires a significant capital expenditure on their part (Rahman and Omar, 2006). This was supported by the Construction Industry Development Board (CIDB) Malaysia (2012), indicating that such a move would involve a large capital commitment, with a down payment of 30% of the project's total value, which is a required up-front payment prior to the execution of the

project. Because of the high capital costs associated with IBS, contractors are unable to win sufficient contracts to cover their costs (Kamar et al., 2014).

Government incentives are one of the keys in improving the IBS preference from stakeholders. This is supported by Abd Jalil et al. (2015). They asserted the government incentives that encourage the use of IBS can facilitate increased usage of this prefabrication concept. However, not all contractors are aware of the government incentives to contractors in adopting IBS. Stakeholders with more experience working on IBS projects is seen to have a greater awareness towards government's incentives in adopting IBS as well as other several types of IBS components that are currently available on the market (Mohamad et al., 2009).

Challenges of IBS adoption in Sarawak

IBS is a construction system that is manufactured in a factory to reduce the amount of additional labour required on the construction site and to allow for faster job completion due to the replacement of components during on-site construction (Fauzi et al., 2017). To make things even easier, the government has pushed the adoption of IBS for new government buildings (Rahman and Omar, 2006). In this section, the challenges of IBS adoption in Sarawak were listed and discussed.

Lack of knowledge in IBS is seen as one of the challenges of IBS adoption. IBS is a new method in the construction industry with many benefits compared to the traditional method. The government, through CIDB, has launched the IBS Roadmap 2003-2010, which lays out a number of well-thought-out plans and proactive initiatives to encourage IBS usage in Malaysia (Rahman and Omar, 2006). Additionally, there is limited expertise in the marketplace among designers and constructors on IBS method (CIDB Malaysia, 2012).

Other than that, logistic problem in rural areas is one of the challenges in adopting IBS. According to Hadi et al. (2017), the overall construction costs would be high due to logistics and shipping costs. This is resulted from the large distance between factories and sites. In addition to the inaccessible areas, such as rural areas that causes the transportation cost to be more expensive, is the current features of the road. Infrastructure such as

roads in rural areas are usually narrow, and unpaved. Therefore, it must be upgraded as it is not suited to handle heavy components of IBS and heavy machineries (Hadi et al., 2017).

Besides that, there are limited IBS manufacturers available with less competitiveness between suppliers as a result of low adoption in IBS. According to Hadi et al. (2017), due to the lack of IBS suppliers, there was no market competition. This has resulted in higher IBS component prices. Furthermore, due to the current low demand and lack of standardization of IBS components, the initial use of IBS would undoubtedly increase overall project material prices, while it would ultimately cut total construction costs in the long term (Kamar et al., 2014). In addition, the low number of IBS suppliers hinder the implementation of IBS in Malaysia (Mohamed et al., 2018).

Most of the construction stakeholders have conventional construction method mentality. The contractor will only perform IBS as an alternative option, whether intentionally or unintentionally because clients have tight schedules and strict quality requirements (Mohamed et al., 2018). Jabar and Ismail (2018) mentioned that due to the ease of having low labour rates that can be obtained, the contractors are hesitant to move into other building method solutions which involve larger capital costs and make IBS investment more hazardous. Moreover, the primary motivation for entering the building business is to maximize profit, and the availability of inexpensive construction labour has contributed to a lack of interest in switching from traditional to IBS methods (Thomas Tarang et al., 2022).

Small contractors lack involvement in IBS due to high capital cost due to component supply, transportation, and heavy plant and machinery in managing component. As it is difficult in getting loans from financial Institutions, making smaller and medium contractors will experience difficulties in getting IBS related project (Mohd Amin et al., 2017). According to Abdul Rahim and Latif Qureshi (2018), due to lack of financial backup, small contractors seem to be unable to set up their own manufacturing plant.

Another reason is lack of interest among the contractors in adopting IBS. Most developers are comfortable utilizing traditional methods since they are accustomed with cost estimates and construction building processes.

However, some contractors were afraid using the IBS system which they were unfamiliar with (Abd Jalil et al., 2015). It must be noted that small contractors are usually familiar with conventional method (Abdul Rahim and Latif Qureshi, 2018). Besides, small contractors lack involvement in IBS because of huge capital of component supply, transportation, and heavy plant and machinery in managing component. In addition, it is because of difficulty in getting loans from financial Institutions (Mohd Amin et al., 2017). Therefore, the small and medium contractors will experience difficulties in getting IBS related project. According to Abdul Rahim and Latif Qureshi (2018), due to lack of financial backup, small contractors seem to be unable to set up their own manufacturing plant.

METHODOLOGY

The study for this research was targeted on the construction industry at Kuching, Sarawak. In this research, the investigation focused on the readiness and challenges in the adoption of Industrialised Building System (IBS) in Sarawak on the perspective of G7 Contractors to contractor workers who operates in Kuching, Sarawak and above 18 years old. The respondents who were not from Sarawak residents were rejected.

The aim of this research is to investigate the G7 contractors' readiness and the challenges faced in adopting IBS for construction in Sarawak. To achieve this aim, this research used survey instrument method. The questionnaires were drafted in accordance to answering the research objectives which were to identify the readiness of G7 contractors to adopt Industrialised Building System (IBS) and to investigate the challenges in adopting Industrialised Building System (IBS) in Sarawak. The questionnaires were then distributed to calculate the number of respondents. The questionnaire was divided into 3 parts which are (1) Demographic information; (2) Readiness of IBS adoption in Sarawak; and (3) Challenges of IBS adoption in Sarawak.

123	SEE ENERGY SON BHD	G7	SARAWAK	KUCHING	08-2339261	082-339263	Yes	Yes	Yes	Paparan
124	SHAFWAH RESOURCES SON BHD	G7	SARAWAK	KUCHING	082-383848	082-445771	Yes	Yes	Yes	Paparan
125	SHOREFIELD SON BHD	G7	SARAWAK	KUCHING	082-432375/439375	082-433990	Yes	Yes	Yes	Paparan
126	SINARAN BAKO REALTY SON BHD	G7	SARAWAK	KUCHING	05-24059935	-	Yes	Yes	Yes	Paparan
127	SRI DATAS CONSTRUCTION (SARAWAK) SON BHD	G7	SARAWAK	KUCHING	082574631	08264688	Yes	Yes	Yes	Paparan
128	SYARIKAT BUMI INDAH JAYA SON BHD	G7	SARAWAK	KUCHING	016-8840111	-	Yes	Yes	Yes	Paparan
129	SYARIKAT PERKAGAAN DASARA SON BHD	G7	SARAWAK	KUCHING	0548885598	082-429388	Yes	Yes	Yes	Paparan
130	TELEBINA TECHNOLOGY SON BHD	G7	SARAWAK	KUCHING	082-578338	082-579731	Yes	Yes	Yes	Paparan
131	TELE KENYALANG ENGINEERING SON BHD	G7	SARAWAK	KUCHING	082-240234	082-419935	Yes	Yes	Yes	Paparan
132	TOKOH BINA SON BHD	G7	SARAWAK	KUCHING	082-430223	082-570223	Yes	Yes	Yes	Paparan
133	TOKOH UHAM SON BHD	G7	SARAWAK	KUCHING	082-313047	082-313147	Yes	Yes	Yes	Paparan
134	TOWNBUILDER REALTY SON BHD	G7	SARAWAK	KUCHING	082-253036	082-230036	Yes	Yes	Yes	Paparan
135	TRIPODS SON BHD	G7	SARAWAK	KUCHING	082251978	082423764	Yes	Yes	Yes	Paparan
136	TULUS GLOBAL SON BHD	G7	SARAWAK	KUCHING	082-530794	082-481855	Yes	Yes	Yes	Paparan
137	VISU UTAMA SON BHD	G7	SARAWAK	KUCHING	01-68095820	082-364226	Yes	Yes	Yes	Paparan
138	WEKAJAYA SON BHD	G7	SARAWAK	KUCHING	08-257066	08-2417590	Yes	Yes	Yes	Paparan
139	ZARACON ENGINEERING SON BHD	G7	SARAWAK	KUCHING	082243611	082244066	Yes	Yes	Yes	Paparan
140	ZECON BERHAD	G7	SARAWAK	KUCHING	082-275555	082-275500	Yes	Yes	Yes	Paparan

Figure 1: Numbers of G7 Contractor in Kuching, Sarawak (CIDB Centralized Information Management System)

Source: Author

According to the CIDB Centralized Information Management System, the number of G7 contractors who were located in Kuching, Sarawak were 140 listed. Krejcie and Morgan (1970) table were used to determine the sample size for the research. As calculated, the total number of questionnaires that needed to be distributed were 103. However, the numbers of questionnaire distributed for this research were 125 and a total of 97 respondents responded. SPSS software version 26.0 was used to conduct the statistical analysis.

Table 1. Questionnaire Distribution and Response

Distribution technique	Google Form (Online distribution)
Questionnaire Distribution	125
Questionnaire Response	97
Percentage (%)	77.6

Source: Author

DATA ANALYSIS

Table 2. Readiness of IBS Adoption in Sarawak

Variable	Frequency of Likert-Scale					Mean Score	Rank
	1	2	3	4	5		
1. Small/new contractor lack readiness in adopting IBS due to financial problem	0	0	8	40	49	4.42	1
2. Personal experience influences IBS adoption	0	0	16	41	40	4.25	2
3. Awareness towards government incentive improve readiness in IBS adoption	0	8	17	42	30	3.97	3
4. Readiness to change conservative construction method	2	9	28	33	25	3.72	4
5. Awareness influence readiness	9	13	30	25	20	3.35	5
6. Financial issue influence the readiness	11	23	20	24	19	3.18	6

Source: Author

Based on the data collected, the level of readiness of IBS adoption in Sarawak variables were shown in Table 2.

The highest rank among the variables indicated is “small or/and new contractor lack readiness in adopting IBS due to financial problem” with a total of 4.42 mean score. This indicates that the respondents strongly agreed that most small or/and new contractors are not ready to adopt IBS in their projects. The result supports Mohd Amin et al. (2017) who stated that it is difficult for smaller and medium contractors in getting loans from financial Institutions making it hard for them to adopt IBS projects.

The second highest respondent rate for level of readiness in Sarawak is “the contractor’s personal experience influences IBS adoption” with a total mean score of 4.25. The result shows that the respondents agreed that past project experience for the constructing contractor affects the readiness to readopt IBS in their future project. This is true in accordance with Mohamad et al. (2009) Mohamad et al. (2009) asserted that a person with a high level of personal experience in adopting IBS is more prepared to adopt IBS in both aspects which are mentally and technically.

Other than that, “awareness towards government incentive improves readiness in IBS adoption” is also one of the higher rankings among variables listed with a mean score of 3.97. This backed up the claim made by Mohamad et al. (2009) that the stakeholders should increase their awareness about the IBS which has been implemented in Malaysian Construction Industry, government encouragement and incentive to IBS adoption, several types of IBS component, various IBS references in market, and various short courses in supporting IBS adoption.

Table 3. Challenges of IBS Adoption in Sarawak

Variable	Frequency of Likert-Scale					Mean Score	Rank
	1	2	3	4	5		
1. Heavy plant dependent for mechanized construction system	0	0	3	40	54	4.53	1
2. Lack of IBS knowledge	0	5	12	38	42	4.21	2
3. Logistic problem (Rural)	0	8	17	45	27	3.94	3
4. Inadequate prefabricating manufacturer	2	8	27	37	23	3.73	4
5. Conventional construction method mentality	5	17	28	25	22	3.43	5
6. High capital cost	10	20	22	25	20	3.26	6
7. Less quantity of IBS adopting project in Sarawak	11	18	29	27	12	3.11	7

Source: Author

Based on the data collected, the challenges of IBS adoption in Sarawak variables were shown in the Table 3.

The highest rank among the variables for challenges in IBS adoption stipulated was “IBS projects is dependent on heavy plant for mechanized construction system.” This shows that the respondents agreed that IBS projects depends a lot on heavy plant. According to Abdul Rahim and Latif Qureshi (2018), due to lack of financial backup, small and contractors seem to be unable to set up their own manufacturing plant.

The second highest challenges variable in adopting IBS in Sarawak listed is the “lack of IBS knowledge.” This shows that the respondents agreed that lack of IBS knowledge is seen as one of the challenges in adopting IBS. This supports CIDB Malaysia (2012) statement that there is a limited expertise in the marketplace among designers and constructors

on IBS method.

The third highest ranking variable that was chosen by the respondents is “logistic problem (Rural)”. The respondents agreed that there are challenges in adopting IBS in Sarawak due to logistic especially in rural area. This supports the statement by Hadi et al. (2017) that the overall construction costs would be high due to logistics and shipping costs. This is because of the large distance between factories and sites.

In addition, the inaccessible areas, such as rural areas which causes the transportation cost to be more expensive. Infrastructure such as roads in rural areas are usually narrow, and unpaved. Thus, it must be upgraded because it is not suited to handle heavy components of IBS and heavy machineries (Hadi et al., 2017).

CONCLUSION

This study aims to identify the G7 contractors’ readiness and investigate the challenges of IBS adoption for construction in Sarawak. The study was conducted focussing on the contractors’ readiness and challenges of IBS adoption.

For the first objective, it can be concluded that majority of the respondents agreed that small or new contractors lack the readiness to adopt IBS due to financial issues. Other than that, the respondents also agreed that personal experience and the contractors’ awareness towards government incentives also do affect the readiness in IBS adoption.

The second objective was to determine the challenges in adopting IBS in Sarawak. As a conclusion, the respondents agreed that the main challenge of IBS adoption is heavy plant dependence of IBS for mechanized construction system. The lack of IBS knowledge is seen to be the second ranking challenges for IBS adoption and logistic problem due to rural area and the third ranking was the challenges in adopting IBS for construction project.

For future research, it is recommended a larger location of respondents

can be focused. Although this research is done in Sarawak, the research can also be done in Sabah region. Other than that, interview session can also be conducted to improve the quality of findings.

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AUTHOR CONTRIBUTIONS

All authors contributed to the design of the research, the questionnaire, and the write-up. The on-line survey, data cleaning and tabulation were undertaken by Universiti Teknologi MARA. All authors have read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declared to have no conflict of interest.

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