

A Review of Current Issues in Industrialised Building System (IBS) for Construction Projects

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ABSTRACT

In Malaysia, the concept of prefabrication is known as Industrialised Building System (IBS). In terms of cost, time, productivity, and quality, IBS is certainly beneficial based on previous local and international research. As part of Construction Industry Development Board (CIDB), CIDB's Construction 4.0 Strategic Plan 2020-2025, the Malaysian construction industry is being urged to employ innovative construction techniques. These initiatives illustrate the Malaysian government's commitment to addressing the IBS agenda. Even though numerous things have been done to enhance the IBS adoption in Malaysia, various issues have arisen to bring about delays, disputes, miscommunications, and payment issues affecting the IBS players. Thus, the primary purpose of this research is to identify current issues and assist policymakers and IBS players in mitigating those issues. The literature review was the first phase of the research, with the secondary data derived from relevant books, journals, articles, theses, dissertations, conference proceedings and reports. The second phase involved the collection of primary data, wherein the information was collected through a preliminary study. The research findings showed that IBS construction still faces challenges and issues when adopted by the industry, where four (4) out of five (5) interviewees stated that the primary integration issues are teamwork or collaboration and procurement. This paper aims to present a literature review and preliminary survey findings related to establishing pertinent integration issues and challenges.

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INTRODUCTION

The construction industry is vital to any nation's growth as it plays an economic role, and physical development provides employment and contributes to the nation's Gross Domestic Product (GDP). It is also one (1) of the most challenging industries in many countries. From 2011 to 2015, Malaysia has experienced significant economic growth, having grown at a steady rate of 6% per annum (Construction Industry Development Board, 2015). In 2020, the Malaysian economy was affected by the spread of COVID-19, which reduced GDP to -5.6% and bounced back to 3.5% in 2021 (Department of Statistics Malaysia, 2021). The Malaysian construction industry has played a pivotal role in its consumption of a broad range of services and goods and its provision of the core infrastructure. Infrastructure provision through the construction industry has also initiated growth and development throughout Malaysia. The Malaysian construction industry is an integral component of the Malaysian economy. It accounts for 4.5% of total GDP in 2019 (Ministry of Works, 2022).

The construction industry offers large-scale positive spillover effects on the manufacturing and services sectors. The construction industry accounts for 15% of the total output of Malaysia's manufacturing sector. It is also a large consumer of a range of services, including knowledge-driven consultancy and engineering, and a broad base of financial services to deliver on infrastructure needs and contribute 5% of the total output of the Malaysian services sector. It is a primary job creator within Malaysia, providing jobs for nearly 9% of the workforce (Construction Industry Development Board, 2015).

Despite its growth and active contribution to the GDP, the Malaysian construction industry is under constant pressure to improve its performance. Construction Industry Master Plan 2006-2015 (CIMP 2006-2015) targeted to increase the construction industry's GDP to 5% by 2015. In National Construction Policy 2030, the Malaysian construction industry's GDP failed to achieve 5%, an average of 4% (Ministry of Works, 2022). The conventional construction method that is extensively practised in Malaysia is labour-intensive, involving formwork fabrication, steel bending and concreting. Even though efforts to promote the Industrialised Building System (IBS) in the Malaysian construction industry have been made, the adoption and uptake of IBS still need to be made. The Malaysian construction industry is also struggling to cope with performance, productivity, quality, environment and health and safety issues. Moreover, the Malaysian construction industry has to deal with the influx of foreign labour in construction (Construction Industry Development Board, 2007; 2015; 2018). With its current levels of productivity, quality, safety, and excessive reliance on unskilled foreign workers, the condition of the industry is different from the future development of Malaysia.

An introduction of Construction 4.0 Strategic Plan 2020-2025 by CIDB to continue the previous agenda in CIMP 2016-2020. This strategic plan primarily geared up the construction industry for the fourth industrial revolution. Construction 4.0 is created to be aligned with the Shared Prosperity Vision 2030 (SPV 2030) and the National Policy on IR 4.0 (Industry4WRD) implementation. In the Construction 4.0 Strategic Plan, the government focus on five (5) core values where digital technology plays a central role in Well Being, Safety and Health, Sustainability and Resiliency, Productivity and Integrity in construction (Construction Industry Development Board, 2021).

LITERATURE REVIEW

Industrialised Building System (IBS) in Malaysia

IBS is the term used by the government and industry players to represent the concept of prefabrication of building components and the adoption of industrialisation in the Malaysian construction industry. IBS is defined as a construction method in which components are manufactured in a controlled environment (on

or off-site), transported, placed and assembled into a structure with minimal additional work (Construction Industry Development Board, 2003; Musa et al., 2016; Tajul Ariffin et al., 2019). IBS adoption in Malaysia aims to reduce the dependence on unskilled foreign workers and save the country's loss in the currency trade (Construction Industry Development Board, 2018). IBS also allows the stakeholder players in the construction sector to project a new image of the Malaysian construction industry to be on par with manufacturing-based industries. Moreover, adopting IBS promises to elevate every level of industrialisation and mechanisation in the Malaysian construction industry (Construction Industry Development Board, 2015). Additionally, adopting IBS will provide efficient, clean and improved safety features associated with the Malaysian construction industry. IBS will also save valuable time, and it helps reduce the risk of project delays and possible monetary losses (Construction Industry Development Board, 2015).

In an attempt to promote the IBS agenda in Malaysia, the Malaysian government, through the Construction Industry Development Board (CIDB), encourages a paradigm move in the construction industry. The paradigm move involves shifting from the conventional construction method approach to the industrialisation perspective by promoting IBS in the construction industry (Nawi et al., 2011). The Malaysian government and CIDB introduced plans and policies to encourage IBS implementation to promote IBS in the Malaysian construction industry. The introduction of the Construction Industry Master Plan 2006-2015 (CIMP 2006-2015) is a guide for the future direction of the Malaysian construction industry by the Malaysian government has highlighted the importance of IBS and sustainability for the Malaysian construction industry (Construction Industry Development Board, 2007). Furthermore, the IBS Roadmap is also introduced to guide the direction of IBS implementation and address issues related to IBS. IBS Roadmap 2003-2010 was the first IBS Roadmap, and it was replaced by IBS Roadmap 2011-2015. The new IBS Roadmap 2011-2015 imposes a high-level intended outcome of implementing IBS compared to the previous IBS Roadmap. After completing CIMP 2006-2015, CIDB introduced the Construction Industry Transformation Program 2016-2020 (CITP 2016-2020), the guideline for the future direction of the Malaysian construction industry. CITP 2016-2020 has highlighted the importance of IBS under the Productivity thrust (Construction Industry Development Board, 2015). The government ensured the IBS agenda in the Construction 4.0 Strategic Plan (2021-2025) as one (1) of twelve (12) emerging technologies to be focused on (Construction Industry Development Board, 2021).

Low adoption and poor performance of IBS in Malaysia

Although IBS has been introduced for over forty (40) years, with well-documented benefits and strong support from the government, the pace of implementation and usage of IBS still needs to be faster and below the government target, as reported by the Construction Industry Development Board (2007). Significant efforts have been in place to push IBS adoption. However, these efforts have yet to yield sufficient impact, and the adoption rate is still low, as reported by Construction Industry Development Board (2015). A survey conducted by CIDB showed the adoption rate at 10.7% for public projects and only 21% for private projects in 2017 (Construction Industry Development Board, 2021). In reality, IBS adoption is still relatively low and still in the growing stages, as stated by Halil et al. (2015) and Shukor et al. (2011). This statement is also in line with the study by Abdullah et al. (2021), where IBS implementation is still low in Sarawak, although the state government has strongly recommended it. According to Alawag et al. (2021), the initiatives by the government to encourage the implementation of IBS also seem not to impact the adoption rate of IBS in Malaysia significantly. Recent research done by Thomas Tarang et al. (2022) highlighted that the high adoption of IBS in Malaysia still has a long way to go. The latest report from CIDB on IBS adoption in government and private projects in Malaysia in 2019 showed growth of adoption of IBS rate for public projects to 36.1% from the 2017 figure (10.7%). The adoption rate in private projects slightly improved to 33.1% from 21% in 2017, which is still behind the government goal (Construction Industry Development Board, 2021).

Construction industry implementation of IBS still needs to improve compared to conventional methods (Rahim & Qureshi, 2018). A number of issues impede the performance of IBS during construction projects, including the preference for conventional methods, lack of integration, delays, poor qualities and cost overrun, and others (Khalil et al., 2016). This poor performance illustrates the need for the IBS project to investigate alternative management practices that will improve performance (Rahim et al., 2020). According to Jaffar & Lee (2020), the integration factor is one (1) of six (6) critical factors that have a significant impact on IBS project performance.

Traditional procurement approach unsuitable for IBS projects

There is a significant barrier to IBS construction due to the conventional procurement commonly used on IBS projects (Zuber et al., 2019; Osman et al., 2017). Furthermore, (Nawi et al., 2011) reported that enhancing procurement systems will result in success for IBS in Malaysian construction. Moreover, according to Zairul (2022), the benefits of IBS cannot be realised if outdated conventional methods and strategies are still employed. There are several research by Viana et al. (2020), Hu & Chong (2020), Ariffin et al. (2018), and Nawi et al. (2014) that recommend an increase in integration by changing from traditional procurement to innovative procurement. This statement is also in line with a study done by Saad et al. (2022), which confirms that enhanced procurement and contracting can clearly define client needs.

RESEARCH METHODOLOGY

A literature review and preliminary study with consenting respondents were used in data collection. By conducting the preliminary study via interviews with IBS players consisting of consultants, contractors and manufacturers, the seriousness of this issue and the significance of the research to the industry is genuine and valid were identified. The interviewees were randomly selected from the CIDB list. However, since this research is still ongoing as this paper was being written, therefore the data presented in this paper is only the findings from the preliminary study. The literature review was the first phase of the research, with the secondary data derived from relevant books, journals, articles, thesis and dissertations, conference proceedings and reports. The second phase involved the collection of primary data, wherein the information was collected through a preliminary study. Table 1 illustrates the background of the preliminary study.

Table 1. Preliminary study background

Description	Remark
Target Respondent	Consultant Contractor Manufacturer/supplier
Sampling Frame	Five (5) respondents from CIDB's source
Duration	Three (3) months
Methodology	Interview Discussions
Software of Analysis	Microsoft Excel 2010

Source: Authors, 2023

FINDINGS AND DISCUSSION

Table 2 summarises the interviewee's sector. The research came to an end after five (5) interviews because all of the responses were consistently similar. In the interview, two (2) of the respondents indicated that they were contractors, followed by two (2) who were manufacturers/suppliers, and one (1) who were consultants. Most of the respondents who participated in the survey have vast experience in the construction industry and IBS projects. According to Table 2, four (4) out of five (5) interviewees have more than ten (10) years of experience in construction, followed by one (1) of interviewees who have only one (1) to five

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(5) years of experience in construction. Based on the interviewees' involvement in IBS projects, three (3) interviewees have been involved in one (1) to five (5) IBS projects, and two (2) interviewees have been involved in six (6) to ten (10) IBS projects. The data collected represents that respondents are experienced both in the construction industry and involved in IBS projects. Therefore, the data collected is reliable and suitable for the preliminary study.

Table 2. Summaries on the interviewee's sector

Interviewee	Respondent sector	Experience in the industry	No. of involvement in the IBS Project
Interviewee 1	Contractor	1 to 5 years	6 – 10 projects
Interviewee 2	Contractor	More than 10 years	1 – 5 projects
Interviewee 3	Manufacturer/Supplier	More than 10 years	1 – 5 projects
Interviewee 4	Manufacturer/Supplier	More than 10 years	1 – 5 projects
Interviewee 5	Architect Consultant	More than 10 years	6 – 10 projects

Source: Authors, 2023

The interview results highlighted the current issues and challenges of IBS construction in Malaysia as per Table 3. The interviewees were explained and questioned about eight (8) issues and challenges of integration in managing IBS projects, which earlier has been derived from literature review such as procurement, teamwork, coordination, site management, supply chain, parties involved, transportation and payment. The findings are summarised in Table 3.

Table 3. Issues the interviewees experienced when adopting IBS construction

Issue	Explanation
Procurement	IBS prefer using Design and Build rather than the conventional method Cost increases up to 30%-40% due to mismanagement. Some of the parties involved needed to learn about IBS, especially procurement in IBS.
Teamwork	Some interviewees preferred that the previous team had been working before—dispute on drawing due to lack of team spirit. Prefer an in-house installer from the manufacturer. Changes in design, although all parties were involved during an early stage.
Coordination	There will be different outcomes if parties are not from an in-house company. Miscommunication between parties (Installer NSC). Manufacturer delay in delivery component.
IBS Process (Site Management)	It would happen if the parties involved needed to gain experience in the IBS project. Double handling and storage area limited due to share with sub-contractor. Access to plant and machinery. Logistic on distance (factory must be in the radius of delivery). An issue is on the route of transportation - not proper planning for the multi-package project. An issue on jointing due to needing an in-house installer. It depends on the financial capability of the contractor to hire experienced IBS workers.
Supply Chain Management	Issues with communication. Delay issues in supplying IBS components. Shortage of raw material delivery and cost of material to factory - This happens in rural areas in obtaining stock.
Parties Involved	Lack of knowledge of IBS for some parties. Some interviewees prefer to work in a team (in-house team). The manufacturer delays the delivery of the component to the site. The installer needs to gain experience in IBS. Consultant – issues on design. Internal problems from other parties.
Transportation	Issues with delivery time and trips (problem in route). Limitation on the lorry. Issues with heavy loads can cause road damage. Minor issues on road damage.

Payment	Cannot enter the site due to size component and site condition due to heavy load. Issues on claim material on site. Problems happen if the contractor does not have strong finances to make an upfront payment.
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Source: Authors, 2023

The interviewees unanimously agreed that all those issues slightly impacted the integration of the IBS project. However, it is found that all the interviewees have indirectly mentioned the issues which are associated with integration. The highlighted issues related to integration are shown in Table 4.

Table 4. Issues related to integration in managing IBS project

Interviewee	Main integration issue
Interviewee 1	Teamwork/collaboration and procurement.
Interviewee 2	Procurement, teamwork/collaboration and coordination.
Interviewee 3	Teamwork/collaboration and coordination.
Interviewee 4	Procurement.
Interviewee 5	All eight (8) issues related to integration.

Source: Authors, 2023

Preliminary studies show that IBS construction still faces challenges and issues when adopted by the industry. Four (4) out of five (5) interviewees stated that the primary integration issues are teamwork/collaboration and procurement. As contrasted with conventional techniques, the construction industry's embrace of IBS still needs to be improved (Rahim & Qureshi, 2018). The traditional procurement approach has come under criticism for the IBS project execution process being fragmented in terms of team integration and collaboration (Ariffin et al., 2018). As a result of that problem, several issues have recently arisen, such as reworks, time delays, rising costs, lack of communication and coordination, wastage, lack of integration, delays, poor quality and cost overrun and others (Khalil et al., 2016; Tajul Ariffin et al., 2019).

CONCLUSION

Based on the above discussion, it can be summarised that these issues can be minimised by improving the procurement through an innovative procurement such as Integrated Project Delivery (IPD), separation of IBS procurement from the main contract, and partnering (Hu & Chong, 2020; Ariffin et al., 2018). Therefore, it is crucial to conduct research that is expected to introduce innovative procurement for IBS projects in Malaysia. Introducing innovative procurement to construction projects can lead to better project performance and more efficient decision-making. In general, the findings of this study will be helpful in accelerating IBS construction in Malaysia and will provide good insight into the industry.

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