RESEARCH IN MANAGEMENT OF TECHNOLOGY AND BUSINESS
e-ISSN: 2773-5044

RMTB

Vol. 5 No. 2 (2024) 395-402
https://publisher.uthm.edu.my/periodicals/index.php/rmtb

Promoting IBS Implementation Among Local Contractors in Construction Industry

Syazwan Hanif[1], Farrah Rina Mohd Roshdi[1]*

[1] *College of Built Environment, Universiti Teknologi MARA Perak Branch, Kampus Seri Iskandar, 32610 Seri Iskandar, Perak, MALAYSIA*

*Corresponding Author: farrahrina@uitm.edu.my
DOI: https://doi.org/10.30880/rmtb.2024.05.02.039

Article Info

Received: 30 September 2024
Accepted: 1 November 2024
Available online: 1 December 2024

Keywords

Industrialised Building System, Strategies, Local Contractors, Construction Industry

Abstract

The term "Industrialised Building System" (IBS) is used in Malaysia to refer to a construction technique in which parts are manufactured in a controlled setting, either on or off site, before being set into an assembled into construction works. The government has already created a number of incentives to encourage local contractors to upgrade and become IBS's contractors. However, for this 21st century, the total number of contractors who applied for the IBS system is still small, despite the government's efforts to promote its use. From this perspective, the goal of this research is to identify several strategies for promoting IBS implementation among local contractors in upgrading their expertise in IBS for construction industry. Additionally, a quantitative approach and a questionnaire survey have been utilised as the data collection instruments to accomplish these goals. Purposive non-probability sampling was utilised as the sampling technique, the sample frame and questionnaire were given to 310 G7 contractors involved with building construction in Kuala Lumpur. Subsequently, data analysis software called Statistical Package for Social Science (SPSS) was utilised to examine the results. Due to an extensive familiarity with and understanding of the IBS system, the majority of contractors are motivated to adopt it. The highest strategies are 68.3% external push from government, 65.6% build more IBS manufacturers, and 67.8% more training courses regarding IBS programmes. Finally, since every strategy received a strongly agreed score, it can be said that most respondents agree with it.

1. Introduction

In Malaysia, the building industry has experienced phenomenal expansion. According to a study by Razak & Awang (2014), there is a demand for more durable buildings, less wasteful construction methods, shorter construction timelines with constrained space, higher-quality structures, shorter on-site labour times, and most impor tantly, an environmentally friendly construction process. Product development in the construction sector has been driven by the development of environmentally friendly building technology. The definitions of construction systems are as follows: Industrialised Building Systems (IBS) are a type of automated technology-based construction technique. In this context, prefabricated components that are prefabricated for on-site installation, prefabricated products, components, or construction systems are all accessible. There are also available prefabricated components and prefabricated components for on-site installation. Additionally, IBS can provide goods that are timely and of a high calibre and choosing IBS will ultimately save you both time and money. Make it possible for Malaysia's building sector to compete on a global scale. Cost-related factors continue

to be the most crucial factors in deciding whether to employ IBS technology in construction projects among all of these significant challenges.

The major disadvantage of IBS in comparison to conventional approaches, according to A. Wong *et al*. (2018), is the higher capital investment cost. For instance, before beginning work, contractors are required to make an initial payment to manufacturers in the range of 10% to 25% of the contract value. This are also anticipated to incur higher initial costs related to the purchase of prefabricated components. In order for IBS manufacturers to produce the precast components before delivering them to construction sites, contractors must pay them in adequate advance. This is because the provider itself needs a higher amount of investment capital to provide casting beds and associated equipment, as well as to train or employ skilled workers to produce and install the IBS components. The viability of IBS components for use in the construction sector is also heavily influenced by other cost-related parameters, including transportation costs from the factory to the building sites, construction and running costs, and other aspects. The absence of small contractors might then be listed as another reason why IBS cannot be implemented to its full potential.

Lack of awareness of IBS construction technique is another important element to take into account, claim Mohamed *et al*. (2018). This is due to the fact that not all contractors, especially those with less experience handling IBS projects, would be open to adopting IBS. The majority of small and medium-sized businesses (SMEs), especially those owned by Bumiputera contractors, have yet to adopt the IBS building process. According to the findings of a survey, many small contractors are adamant about not utilising IBS in the construction company. The contractors still use the conventional method of construction for as long as feasible. According to the contractors, the main reason for this is that they are too acclimated to and at ease with the conventional system, and the technology is better suitable for small-scale initiatives. Thus, consequently the contractors remained and do not need to change to IBS.

2. Literature Review

According to Trigunarsyah *et al*. (2019), the use of IBS for the construction of the first prefabricated building, known as the Colonial Cottage for Emigrants, by H. Manning in 1833 is evidence that the development of IBS began with the industrial revolution. The London Crystal Palace project then got under way in 1851 under the direction of Joseph Paxton. Cast iron and glass manufacturing techniques were adopted by Paxton, who also established a modular design that could be preassembled off site, installed, and then set up on site. The end result of Paxton's endeavour was 1851. Since then, the impact of the two world wars that took place between 1918 and 1945 has continued the development of IBS. Many nations at the period, particularly those in Europe including the United Kingdom, Germany, the Netherlands, and Sweden, as well as Japan, faced an urgent housing shortage.

In this case, the Japanese government began a programme to meet the need for 4.2 million housing units in the middle of the 1940s to address this problem. In more contemporary examples, according to Styhre *et al*. (2022), a large-scale governmental initiative directly led to the construction of one million additional housing units, the bulk of which were rental apartments, during the years 1965-1975. From this angle, the Industrialised Building System was a strong substitute for the traditional building method, taking into account the constraints of project schedule and cost as well as the requirement to fulfil the required project quality and quantity.
The data in the IBS list provided by the CIDB can be very useful to users in the construction business. Customers can search the database for registered public and private construction companies in Malaysia that have completed projects in accordance with IBS criteria. Table 1 shows the major IBS categories, and the number of IBS Manufacturers and Suppliers related to IBS building methods based on the CIDB's available data on the construction industry. Table 1 below shows the number of IBS Manufacturers and Suppliers as listed in CIDB Malaysia, as per Saad *et al*. (2022).

Table 1 *Number of IBS Manufacturers and Suppliers as listed in CIDB Malaysia*

Category	IBS Categories	IBS Manufacturer/Supplier
A	Precast Concrete System	96
(a)	Precast	77
(b)	Onsite	19
B	Reusable Formwork System	36
C	Metal Framing system	62
(a)	Steel Structure	30
(b)	Metal Root Truss	32
D	Timber Framing System	5
E	Block Work System	39
(a)	Solid Block	4
(b)	Hollow Block	11
(c)	Interlocking Block	5
(d)	Light Weight Block (AAC)	6
(e)	Light Weight Block (CLC)	13
F	Innovative System	66
(a)	Total IBS Players	304

In addition, in accordance with CIDB (2022), the supplier of IBS listed in Table 2 has undergone an evaluation to ensure the quality of products and components and includes the full process of Verification, Validation, Testing, and Certification as outlined in the Construction Industry Standard (CIS:24), which acts as a guide to monitor and assess product quality and obtain certification that complies with the test standard.This analysis suggests that the IBS manufacturer has a good probability of being chosen by public and private institutions, given that these organisations want to cooperate with businesses who produce high-quality products.

Table 2 *IBS Categories and Manufacturers until October 2022*

Category	IBS Categories	IBS Manufacturer/Supplier
	Precast concrete system	32
	Blockwork system	10
	Metal framing system	21
	Timber framing system	1
	Reusable formwork system	14
	Innovative system	20

Even though there are many obstacles to deploying IBS, an impact on local contractors' use of it because its level of adoption is still fairly low in comparison to the conventional techniques that are more convenient. To increase the overall number of IBS contractors in Malaysia, there are numerous efficient techniques. In this perspective, it may be connected to the government's external pressure to expand IBS manufacturing and IBS training programmes to generate trained contractors. These tactics have been discovered and researched in order to boost IBS method uptake. The following is a list of those tactics.

The government's assistance in terms of extending the facilities and providing incentives for IBS research and development was indicated as a significant strategy for improving the implementation of IBS based on consultant viewpoints (Ali *et al*., 2018). In this situation, the government can create more seminars or classes at institutions that emphasise the IBS technique. This will increase awareness among individuals, particularly students, and help them get to know it much better. These methods inevitably lead to a rise in IBS usage in Malaysia. On the other hand, G7 Contractor can manage projects of any size in Malaysia. This suggests that, in contrast to small contractors who frequently lack the finances necessary to do so, they have no trouble adopting IBS since they encounter a solid financial foundation. In this instance, Kwang *et al.* (2021) claimed that research funds acted as seed money for government contractors. From this vantage point, small contractors can resolve financial issues and leave on comfort zone by implementing either the conventional technique or the IBS, or both. As a result of the quicker construction time, the profit will be received and increase automatically.

Hadi *et al*. (2017) noted that since there was no IBS manufacturer, there was no pricing competition, which increased the cost of IBS components. The basic tenet of economics holds that when there is a shortage of goods compared to the demand for it, the price of the good will inevitably rise. The ideal approach in this situation is to increase the overall number of IBS manufacturers in Malaysia. According to Ali *et al.* (2018), it is anticipated that

a rise in IBS manufacturers will raise both supply and demand for the use of IBS in the construction sector, resulting in the development of a more sustainable and balanced ecosystem. The local contractor will then seize this chance to make money by adopting the current trend in the building sector, which is switching to IBS or combining it with conventional methods, once the number of IBS producers has increased. From the higher up until the personnel on site and off site, this will automatically persuade them to learn and embrace IBS.

According to CIDB (2018), GiatMara has implemented an incentive for SME's to apply ISO 9001 for the first year. These methods inevitably lead to a rise in IBS usage in Malaysia. Furthermore, according to Ali *et al*. (2018), IBS awareness campaigns should be expanded to inform IBS participants and the general public about the advantages and efficacy of IBS in the construction sector. With regards to these incentives, the IBS participants, particularly local contractors, will learn a lot about IBS, which may change from the perspective of this approach from the mindset that IBS might harm profit, into the mindset that this development is worthy of being put into practise. If contractors have staff members who can handle IBS installation, they will also be able to reduce expenses. According to Abd Jalil & Shaari, contractors typically have two options during installation: either choose the IBS manufacturers to supply and install, which will cost more money, or conduct installation with own employees, which will cost less money. Performing this. Since the employees are equipped to adopt IBS on the job site, the contractor will be more confident to begin employing it.

3. Research Methodology

Hoover (2013) asserts that quantitative approaches to literature can quantitatively reflect the aspects or characteristics of literary writings. These methods apply the robust, precise, and well-recognized mathematical tools to the task of measuring, categorising, and evaluating literary compositions. The approach has recently received considerable support in the domains of sociology and education, especially when used with numerical strategies like presenting data in numerical form or carrying out lab-based research. Additionally, quantitative approaches usually emphasise objective measurements, statistical, mathematical, or numerical analysis of data collected through surveys, questionnaires, and polls, as well as the use of computing techniques to alter previously collected statistical data. Quantifiable data can be statistically evaluated to support or refute a theory or a theory-challenging assertion, according to King *et al*., 2018). For this study, survey questionnaires are used to gather information from respondents for a number of purposes. One of the most practical and often utilised methods is the use of a survey questionnaire. After that, the data is collected, handled, and used. This section has 12 questions that discuss 4 ideas for encouraging IBS use among regional contractors in the building sector. To gauge the respondent's level of agreement with the mentioned strategies, the questions in this section also used a Likert scale.

4. Results and Discussion

Firstly, the recommendation strategies suggest that the government should establish additional lectures or seminars in universities that specifically focus on the IBS technique. As previously observed, the deficiency in awareness and knowledge can be effectively addressed when there is a multitude of resources available.
Classes have been created to provide incentives for promoting the advantages of IBS. According to the initial table, it is evident that 68.3% of the 183 respondents strongly agree with this statement, while 31.7% think that it is vital to consider developing new classes or seminars in the institution.

Another example of external government intervention is the provision of funding, such as start-up capital, to contractors. This financial assistance aims to support small contractors in addressing financial challenges. As mentioned in the previous chapter, a significant reason for the limited participation of local contractors in IBS installation is the substantial upfront expenses. Table 3 shows the result related to the external push by government.

Research in Management of Technology and Business Vol. 5 No. 2 (2024) p. 395-402

Table 3 *External Push by Government*

The government can develop more classes or seminar in the university which focuses on IBS method.

		Frequency	Percent	Cumulative Percent
Valid	Agree	58	31.7	31.7
	Strongly Agree	125	68.3	100.0
	Total	183	100.0	

Fund like start-up capital to contractors from the government where it can help small contractors to overcome their financial problems.

		Frequency	Percent	Cumulative Percent
Valid	Agree	83	45.4	45.4
	Strongly Agree	100	54.6	100.0
	Total	183	100.0	

Small contractors might overcome their financial difficulties and leave their comfort zone by switching from conventional to IBS or using both.

		Frequency	Percent	Cumulative Percent
Valid	Agree	62	33.9	33.9
	Strongly Agree	121	66.1	100.0
	Total	183	100.0	

This recommendation was made to encourage local contractors to use the IBS building approach by providing funding to those who lack financial stability. The G7 contractor was asked this question in order to obtain the necessary financial data for the implementation of a new building approach, where capital is of utmost importance. The data obtained can enhance the overall construction project. According to the second figure, 54.6% of the 183 respondents strongly agreed with the statement, and the number of respondents who replied was 100. The data indicates that 45.4% of the respondents, totaling 83 individuals, agreed with it.

Subsequently, the third inquiry pertains to how small contractors might surmount the financial challenges and venture from outside familiar territory by transitioning from traditional methods to Industrialized Building Systems (IBS), or by adopting a combination of both approaches. According to the third number provided, the collected data indicates that 66.1% of the population has a total of 121 respondents expressed high agreement with the statement, indicating that they are able to effectively manage the firm's finances. Subsequently, 33.9% of the participants expressed an agreement, including a total of 62 replies. Based on the data analyzed, it is evident that the government plays a vital role in promoting the application of IBS to local contractors.

Table 4 *Build more IBS manufacturers*

Increased IBS manufacturers would raise supply and demand in the construction industry.

		Frequency	Percent	Cumulative Percent
Valid	Agree	69	37.7	37.7
	Strongly Agree	114	62.3	100.0
	Total	183	100.0	

Local contractors will seize this opportunity to earn by switching to IBS or combining it with conventional methods.

		Frequency	Percent	Cumulative Percent
Valid	Agree	63	34.4	34.4
	Strongly Agree	120	65.6	100.0
	Total	183	100.0	

This will immediately persuade them to learn and embrace IBS, from higher-ups to on-site and off-site staff.

		Frequency	Percent	Cumulative Percent
Valid	Agree	76	41.5	41.5
	Strongly Agree	107	58.5	100.0
	Total	183	100.0	

According to the Table 4 provided, there are three questions that pertain to the second recommendation, which is to increase the number of IBS producers. The stated questions serve as ideal strategies for promoting the implementation of IBS construction, with the purpose of enhancing the demand and supply of IBS components. Increasing the number of IBS producers would have a positive impact on the construction industry by boosting both the supply and demand. According to the initial table, it is evident that 62.3% of the 183 participants strongly agreed with this statement, indicating a frequency of 114 respondents. Out of the 63 responders, 37.7% agreed with this data.

The second concern that characterizes this strategy is if local contractors would capitalize on this potential by adopting or integrating IBS with traditional procedures in order to generate income. Based on the second table provided previously, it is evident that 65.6% of the 183 participants strongly agreed with this statement, with a total of 120 respondents expressing this view. 34.4% of respondents acknowledged this fact, with 63 of them expressing agreement. Subsequently, the third inquiry involves the establishment of further IBS manufacturing facilities, which will promptly encourage individuals at all levels, including executives and both on-site and off-site personnel, to acquire knowledge about and adopt IBS. Based on the data shown in the third table, 58.5% of the respondents, totaling 107 individuals, strongly agreed with the statement. This agreement is attributed to the belief that it can effectively influence higher authorities to proceed with the building of IBS. As a result, a total of 76 individuals, which accounts for 41.5% of the whole population, voiced an agreement. The data collected suggests that there is a multiplier effect that encourages the broader use of IBS by addressing crucial aspects such as supply, affordability, quality, technology, knowledge sharing, and industry expansion. This, in turn, motivates additional local contractors to adopt IBS and participate in its wider implementation.

Table 5 *Courses regarding IBS programme*

IBS awareness programmes should be expanded to inform IBS players and the public about IBS's benefits and effectiveness in construction.

		Frequency	Percent	Cumulative Percent
Valid	Agree	62	33.9	33.9
	Strongly Agree	121	66.1	100.0
	Total	183	100.0	

The contractor can also cut costs if they have employees who can handle IBS installation since they have already attended IBS training programs.

		Frequency	Percent	Cumulative Percent
Valid	Agree	75	41.0	41.0
	Strongly Agree	108	59.0	100.0
	Total	183	100.0	

IBS participants, especially local contractors, will learn a lot about IBS, which may influence their opinion of this advancement.

		Frequency	Percent	Cumulative Percent
Valid	Agree	59	32.2	32.2
	Strongly Agree	124	67.8	100.0
	Total	183	100.0	

Based on Table 5, there are three additional questions that determine the third recommendation. Which training course is more focused on IBS programs? The questions given are also appropriate for addressing a deficiency to the importance of awareness and knowledge in relation with limited engagement of local contractors in implementing IBS. Firstly, it is necessary to expand IBS awareness programs in order to educate both IBS players and the general public about the advantages and efficacy of IBS in construction. The initial table indicates that 66.1% of the 183 participants who were polled strongly agreed with the statement in question, which corresponds to the number of 121 individuals that were questioned. 33.9% of the respondents followed this data, and out of those, 62 agreed with it. Furthermore, another aspect of this project is that the contractor can save expenses by employing individuals who are proficient in IBS installation, as have already completed IBS training programs. Based on the above table, it is evident that 59% of the 183 participants strongly concurred with this statement, with a total of 68 answers indicating so. 41% of the respondents followed this data, and 75 of them agreed with it. Furthermore, the members in the IBS program, particularly local contractors, will acquire substantial knowledge about IBS, potentially impacting the perception of this innovation. Does the third question establish this point? Based on the data shown in the third table, 67.4% of the respondents, totaling 128 individuals, expressed strong agreement with the statement. This believes it has the potential to convince higher authorities to proceed with the building of IBS. Meanwhile, 59 individuals, accounting for 32.2% of the overall population, voiced the agreement. The data collected from these three questions suggests that offering training courses on IBS programs can promote the acquisition of knowledge, skills, and a supportive network, which in turn encourages the broader implementation of IBS in the sector. Professionals who have received training are more prepared to adopt IBS, resulting in more participation from local contractors and the realization of the advantages provided by this contemporary construction method.

5. Conclusion

According to Ali *et al*. (2018), the government should mandate IBS for enterprises operating in the private sector in addition to the public sector. In order to enhance this system's adoption in the private sector, the government should start a coordinated approach. in support of the country's growth policy. Since the IBS system is crucial to the growth of sustainable industrial demand and supply, businesses are required to adopt it. In this context, it is clear that both sectors must play significant roles in doing research on the IBS in order to develop the construction approach that corresponds to the current situation and trend in some nations. Long-term and strategic IBS research should involve universities, businesses, and organisations from the start, according to Syafiqah *et al*., (2022). Additionally, Al-Aidrous *et al*. (2022) noted that financial incentives like lower taxes and low-interest loans can be used to encourage the adoption of IBS. By doing this, it may have a greater impact on IBS research and development as it seeks to advance the construction sector.

Acknowledgement

The author would like to thank the College of Built Environment and Universiti Teknologi MARA for its support.

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design****: Syazwan Hanif & Farrah Rina Mohd Roshdi;* ***data collection****: Syazwan Hanif & Farrah Rina Mohd Roshdi;* ***analysis and interpretation of results****: Syazwan Hanif & Farrah Rina Mohd Roshdi;* ***draft manuscript preparation****: Syazwan Hanif & Farrah Rina Mohd Roshdi . All authors reviewed the results and approved the final version of the manuscript.*

References

Abd Jalil, A. Bin, & Shaari, S. M. (2022). Installation IBS Components in Malaysian Housing Projects; The Difficulties and Solutions. IOP Conference Series: Earth and Environmental Science, 1067(1), 012063. https://doi.org/10.1088/1755- 1315/1067/1/012063

Al-Aidrous, A. H. M. H., Shafiq, N., Al-Ashmori, Y. Y., Al-Mekhlafi, A. B. A., & Baarimah, A. O. (2022). Essential Factors Enhancing Industrialized Building Implementation in Malaysian Residential Projects. Sustainability (Switzerland), 14(18), 1–18. https://doi.org/10.3390/su141811711

Ali, M. M., Abas, N. H., Affandi, H. M., & Abas, N. A. (2018). Factors impeding the industrialized building system (IBS) implementation of building construction in Malaysia. International Journal of Engineering and Technology (UAE), 7(4), 2209–2212. https://doi.org/10.14419/ijet.v7i4.17863

CIDB. (2018). Impact Study on ISO 14001 Implementation to G7 Contractors With Annual Turnover RM200 Million And Above. CIDB Malaysia, 36. https://www.cidb.gov.my/sites/default/files/2020-12/8.CIDB-Tech.-Pub.- No.186Impact-Study-on-Implementation-ISO-14001.pdf

Hadi, N. A., Muhamad, W. M. N. W., & Othman, M. K. F. (2017). Critical factors of implementing Industrialised Building System in Sarawak: Research on SMEs. IOP Conference Series: Earth and Environmental Science, 67(1). https://doi.org/10.1088/1755-1315/67/1/012006

Hoover, D. L. (2013). Quantitative Analysis and Literary Studies. A Companion to Digital Literary Studies, 517–533. https://doi.org/10.1002/9781405177504.ch28

King, A., Goldfarb, B., Smith, R. H., & Simcoe, T. (2018). Learning From Testimony on Quantitative Research In Management Journal: Academy of Management Review Individual learning < Managerial and Organizational Cognition, Knowledge Flows and Knowledge Management < Organization and Management theory

Kwang, J. J., Seow, T. W., Mohamed, S., & Masrom, A. N. (2021). Strategies in Promoting Industrialised Building System (IBS) among Contractors. Research in Management of Technology and Business, 2(1), 1021–1033. https://publisher.uthm.edu.my/periodicals/index.php/rmtb/article/view/2035/751 %0A

Razak, F. M., & Awang, H. (2014). The contractors' perception of the implementation of industrialised building system (IBS) in Malaysia. MATEC Web of Conferences, 10, 3–7. https://doi.org/10.1051/matecconf/20141004003

Saad, S., Alaloul, W. S., Ammad, S., Altaf, M., & Qureshi, A. H. (2022). Identification of critical success factors for the adoption of Industrialized Building System (IBS) in Malaysian construction industry. Ain Shams Engineering Journal, 13(2), 101547. https://doi.org/10.1016/j.asej.2021.06.031

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104(March), 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Syafiqah, N., Mohd, I., Kasim, N., Noh, H. M., Hilmi, M., & Abd, I. (2022). Kajian Penggunaan Sistem Binaan Berindustri (IBS) Bagi Projek Pembinaan Pasca Covid-19. 3(1), 459–470.

Trigunarsyah, B., Santoso, T. P., Hassanain, M. A., & Tuffaha, F. (2019). Adopting the industrialised building system in Saudi Arabia: barriers and enablers. Infrastructure Asset Management, 6(3), 185–194. https://doi.org/10.1680/jinam.18.00001

Research in Management of Technology and Business Vol. 5 No. 2 (2024) p. 395-402

Wong, A., Lin, Z., & Siew Chong, C. (2018). Cost Issue: Key Limiting Factor That Affects Ibs Application In Malaysian Construction Industry Corresponding author: a zhilin0108@hotmail. Inti Journal built Environment Faculty of Engineering and Quantity Surveying, 2(3), 2– 7.