

Mind the Gap: An Analysis of Awareness Versus Practice in the Adoption of IBS by Malaysian Contractors

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Abstract

This study provides a large-scale empirical analysis of the awareness, perception, and adoption of Industrialised Building Systems (IBS) among Malaysian contractors, focusing on the gap between industry knowledge and practical implementation. A quantitative cross-sectional survey was conducted, involving 907 contractors registered with the CIDB in Malaysia. The data was analyzed using descriptive statistics to determine the levels of awareness and perception, and Pearson correlation analysis was used to identify the relationship between key variables. The results reveal that the overall awareness and positive perception of IBS among contractors are at a moderate level (Mean \approx 3.4), suggesting that the system has not yet achieved full conviction within the industry. This moderate acceptance is compounded by practical barriers, with contractors identifying poor craftsmanship as a key implementation issue. Crucially, a strong, positive correlation ($r = 0.685$, $p < 0.01$) was found between the awareness of IBS benefits and the perception of its efficiency, indicating that a clear understanding of its advantages is a primary driver of confidence. By utilizing a large-scale sample, this research moves beyond preliminary findings to present a more realistic and nuanced view of the "awareness-practice gap." It concludes that the challenge is twofold: a moderate level of industry buy-in combined with significant on-site execution barriers.

Keywords: Industrialised Building System (IBS), Construction Industry, Technology Adoption, Awareness-Practice Gap, Malaysian Contractors, TVET

Introduction

The construction industry serves as a critical engine for Malaysia's economic development, creating extensive employment opportunities and fostering linkages with numerous other key sectors (Construction Industry Development Board, 2019). To propel this vital industry forward, the Malaysian government has consistently advocated for modernization through the adoption of innovative technologies. One of the most prominent of these is the Industrialised Building System (IBS), a construction method defined by the manufacture of components in a controlled environment—either on-site or off-site—which

are then transported, positioned, and assembled with minimal additional site work (MIDA, 2021).

Recognized as a form of Modern Method of Construction (MMC), the benefits of IBS are well-documented in academic literature and industry reports. Key advantages include accelerated construction timelines, reduced overall project costs, decreased dependency on foreign labor, enhanced building quality, and the promotion of safer, more organized work environments (CIDB, 2019). The implementation of IBS in Malaysia is not a recent phenomenon; its history dates back to the 1960s with the government's pioneering use of precast concrete for public housing projects (Bahri, Hassan, & Ahmad, 2007). In recent years, policy support has driven its adoption, with one report indicating a significant 64% increase in IBS usage across private and public projects by 2020 (Dagang News, 2022).

However, despite its long history and proven benefits, the widespread adoption of IBS remains a persistent challenge. A significant gap exists between the national agenda to promote IBS and its practical, on-the-ground implementation by contractors. This discrepancy suggests that while awareness may be increasing, it has not fully translated into consistent practice. Several underlying issues contribute to this gap. A primary barrier is the reported lack of in-depth knowledge and technical understanding of IBS among contractors, which fosters a continued reliance on conventional, labor-intensive methods (Razali, 2016).

Furthermore, the successful implementation of IBS is highly dependent on a skilled workforce capable of managing its unique processes, from component manufacturing and assembly to logistics and maintenance. A deficit in expert manpower has been identified as a critical factor hindering the system's potential (Razali, 2016). Compounding this issue are economic and operational concerns. Many firms perceive the initial investment cost for IBS as prohibitively high, leading them to opt for conventional methods that rely on lower-wage foreign labor. Additionally, challenges related to the quality control and standardization of IBS components, particularly among smaller manufacturers, have created apprehension regarding the long-term durability and structural integrity of IBS-built projects (Razali, 2016).

This study, therefore, seeks to investigate this critical gap between awareness and practice. It aims to provide an empirical analysis of the current levels of awareness, perception, and adoption of IBS among construction contractors in Malaysia. Specifically, this research will address the following objectives:

1. To assess the awareness level of construction contractors towards the concepts, benefits, and challenges of Industrialized Building Systems (IBS).
2. To examine the contractors' perception of the impact of IBS on project efficiency and the sustainability of the construction industry.
3. To analyze the relationship between the awareness of IBS benefits and the perception of its implementation efficiency.

By identifying the specific barriers and perceptions held by contractors, this study aims to provide valuable insights for policymakers and industry stakeholders to formulate more effective strategies in accelerating the true adoption of IBS, thus transforming the future of the Malaysian construction industry.

Literature Review

This section reviews the existing body of literature relevant to the study of Industrialised Building Systems (IBS) in the Malaysian context. It begins by establishing a clear definition of IBS and tracing its historical development within the nation, including key government policies that have shaped its trajectory. The review then outlines the official classification of IBS types as recognized by the Construction Industry Development Board (CIDB). Subsequently, it synthesizes findings from previous studies on the documented benefits that drive IBS adoption, as well as the significant challenges and barriers that impede its widespread implementation. Finally, this section will establish the research gap by highlighting the need for a current analysis of awareness and perception levels among contractors, thereby justifying the objectives of this study.

The Concept and History of IBS in Malaysia

The Industrialised Building System (IBS) is officially defined as a construction method where components are manufactured in a controlled environment, either off-site or on-site, before being transported and assembled into a final structure with minimal site work (CIDB, 2011). This approach, also known as Modern Method of Construction (MMC), has been a key focus of the Malaysian government's strategy to modernize the construction sector. To enforce its adoption, a policy was introduced requiring government projects to achieve a minimum IBS Score of 70 (CIDB, 2011).

The history of IBS in Malaysia dates back to the 1960s. Following official visits to several European nations to study their housing development programs, the Malaysian government initiated its first IBS pilot projects in 1964, which included the construction of the Tuanku Abdul Rahman Flats and the Rifle Range Road Flats in Penang (Thanoon et al., 2003). Since these early projects, IBS has been employed selectively, particularly for developments requiring rapid and high-quality completion, such as the 3,000-unit Pekeliling Flats in Kuala Lumpur. Despite this long history, its adoption rate in Malaysia still lags significantly behind that of developed nations in Europe and Asia (Thanoon et al., 2003).

Classification of IBS in Malaysia

To standardize its implementation, the Construction Industry Development Board (CIDB) has categorized IBS into five primary groups based on their structural components. This classification provides a framework for contractors and stakeholders to understand and apply the various available systems.

- **Precast Concrete Systems:** This is one of the most common IBS forms, involving the production of concrete elements such as beams, columns, slabs, and wall panels in a factory setting. These components are then transported to the site for assembly. The controlled factory environment allows for higher quality control, greater precision, and increased safety compared to traditional on-site casting.
- **Steel Frame Systems:** This category includes structures built using steel components like beams, columns, and trusses. Steel framing offers a high strength-to-weight ratio, enabling faster erection times and design flexibility. It is commonly used in high-rise buildings, industrial warehouses, and complex structures.
- **Steel Formwork Systems:** These systems utilize reusable steel moulds (formwork) for in-situ concrete construction, such as tunnel forms that allow walls and slabs to be cast simultaneously. This method significantly speeds up the construction cycle for projects

with repetitive floor plans, like hotels and apartment buildings, while reducing the waste associated with traditional timber formwork.

- Prefabricated Timber Framing Systems: This system involves the off-site fabrication of timber frames, wall panels, and roof trusses. It is recognized for its sustainability and speed of assembly. While historically common, its modern application in Malaysia is growing, particularly in resort and residential construction.
- Blockwork Systems: This category refers to the use of interlocking concrete masonry units (CMU) or blocks that are manufactured to precise dimensions. While simpler than other forms of IBS, this system improves on traditional brick-laying by enhancing construction speed and reducing the need for extensive wet mortar joints.

Documented Benefits of IBS

Numerous studies and industry reports have validated the significant advantages of adopting IBS over conventional construction methods. These benefits are the primary drivers for its promotion by government bodies like CIDB.

- Increased Productivity and Speed: The most cited benefit is the significant reduction in construction time. By manufacturing components concurrently with site preparation, projects can be completed much faster. The construction of Sekolah Kebangsaan Brickfields 1 in Kuala Lumpur within three months is a classic example of this efficiency (IBS Centre, 2010).
- Enhanced Quality and Safety: Factory-based production allows for stringent quality control, resulting in components with higher precision and consistency. This controlled environment also reduces the on-site risks and accidents associated with the "3D" challenges—Dirty, Difficult, and Dangerous—that plague conventional sites (Ismail, 2009).
- Cost and Waste Reduction: Although initial capital costs can be high, IBS leads to lower overall project costs through reduced labor requirements, shorter construction periods, and minimal material wastage on-site (CIDB, 2006).
- Reduced Dependency on Foreign Labor: By shifting a significant portion of the work from on-site manual labor to off-site manufacturing, IBS directly addresses the construction industry's heavy reliance on foreign workers, a key national agenda.

Challenges and Barriers to IBS Adoption

Despite the clear benefits, several persistent barriers have hindered the widespread adoption of IBS in Malaysia. These challenges form the basis of the "gap" this study seeks to investigate.

- High Capital Cost and Financial Risk: The high initial investment required for manufacturing facilities, specialized equipment, and transportation is a major deterrent for many contractors, especially smaller firms. This financial barrier is often cited as the primary reason for preferring lower-cost, conventional methods (Razali, 2016; Hamid et al., 2008).
- Lack of Skilled Workforce and Technical Expertise: The IBS supply chain requires a different skill set, from designers and engineers proficient in modular design to factory workers and on-site installers with technical training. A shortage of this specialized expertise across the industry has led to issues with installation quality and overall project success (Razali, 2016).
- Design and Coordination Issues: Effective IBS implementation demands intensive coordination between architects, engineers, manufacturers, and contractors from the

very early stages of a project. A fragmented design process and poor communication can lead to costly errors and negate the system's benefits (Thanoon et al., 2003).

- **Negative Perceptions and Industry Resistance:** A lingering negative perception among some industry players, who view IBS as rigid, aesthetically limited, or structurally inferior, creates resistance. This is often coupled with a lack of awareness and a general reluctance to move away from long-established conventional methods (Kamarul, 2007).

Methodology

This section outlines the research methodology employed to achieve the objectives of the study. It details the systematic process used to gather and analyze data regarding the awareness, perception, and adoption of Industrialised Building Systems (IBS) among Malaysian contractors. The section is organized into several key sections: research design, population and sampling, research instrument, data collection procedures, and the methods used for data analysis.

Research Design

This study adopted a quantitative research design utilizing a cross-sectional survey method. This approach was chosen as it is highly effective for gathering standardized data from a large sample to describe, summarize, and identify relationships between variables at a single point in time. The quantitative design allows for the statistical analysis of contractors' awareness levels and perceptions, enabling the researchers to draw generalizable conclusions and test the relationships between key variables, such as the correlation between awareness and perception of efficiency.

Population and Sampling

The target population for this research comprised construction contractors registered with the Construction Industry Development Board (CIDB) in Malaysia. Due to the large size of the population, a non-probability sampling technique, specifically purposive sampling, was employed. This method was selected to ensure that the respondents were relevant to the study's focus, targeting contractors with the experience and context to provide meaningful insights on IBS.

The final sample consisted of 907 contractors from various registration grades. As indicated in the demographic analysis (Chapter 4, Table 1), the sample represents a diverse range of contractors, providing a robust basis for the study's findings.

Research Instrument

The primary instrument used for data collection was a structured questionnaire, titled "Feedback Form on Awareness and Perceptions of Industrialized Building Systems (IBS)". The questionnaire was designed to be self-administered and was divided into five main sections:

- **Section A: Demographic Profile:** This section collected background information about the respondent's company, including their CIDB registration class.
- **Section B: Level of Awareness:** This section consisted of six items designed to measure the respondents' general and specific awareness of IBS concepts, benefits, and challenges.
- **Section C: Perception of IBS:** This section contained items aimed at gauging the respondents' views on the impact and effectiveness of IBS in the construction industry.

- Section D: Implementation of IBS: This section explored the respondents' practical experience with IBS, including its current use, challenges encountered, and adoption of related innovations.
- Section E: Open-Ended Questions: This final section included qualitative questions to gather broader opinions on the future and current prevalence of IBS.

A five-point Likert scale was used for Sections B, C, and D, allowing respondents to rate their agreement or awareness level from 1 ("Not Good At All" / "Strongly Disagree") to 5 ("Very Good" / "Strongly Agree").

Data Collection Procedure

The data was collected over a period from November 2023. The questionnaires were distributed electronically to the target respondents. This method was chosen for its efficiency in reaching a geographically diverse sample of contractors and for ease of data management. A total of 907 valid and complete responses were received and used for the final analysis.

Data Analysis

All collected data were compiled and analyzed using statistical software (anda boleh sebut SPSS atau Microsoft Excel). The analysis was conducted in three main stages to address the research objectives:

1. Descriptive Statistical Analysis: This was used to summarize the data. Frequencies and percentages were calculated for the demographic data (Section A). For the Likert scale data (Sections B, C, D), mean scores and standard deviations were calculated to determine the central tendency and dispersion of responses regarding awareness and perception levels.
2. Interpretation of Mean Scores: To interpret the level of awareness and perception, the calculated mean scores were categorized based on the following scale: 1.00 – 2.33: Low Level, 2.34 – 3.67: Moderate Level, and 3.68 – 5.00: High Level
3. Inferential Statistical Analysis: To address the third research objective, a Pearson correlation analysis was conducted. This statistical test was used to measure the strength and direction of the linear relationship between key variables, specifically between the *awareness of IBS benefits* and the *perception of its efficiency*.

Results and Analysis

This section presents the findings obtained from the analysis of the survey data collected from 907 construction contractors in Malaysia. The results are organized according to the research objectives.

Demographic Profile of Respondents

The demographic profile of the respondents was analyzed based on their CIDB contractor grade. Table 1 shows that the sample is well-distributed across G2, G3, and G4 contractors, providing a broad representation of small to medium-sized contractors in Malaysia.

Table 1

Profile of Respondents (N=907)

Contractor Grade	Frequency (n)	Percentage (%)
G4	329	36.3
G3	272	30.0
G2	306	33.7
Total	907	100.0

Level of Awareness and Perception Towards IBS

To address the research objectives, the levels of awareness and perception were measured. The mean scores are presented in Table 2. The results indicate a moderate level of awareness and perception across all items, with mean scores consistently centered around the neutral point of the scale (3.0).

Table 2

Mean Scores for Awareness and Perception (N=907)

Item	Mean	Std. Deviation	Level
AWARENESS			
Overall awareness of IBS	3.40	1.109	Moderate
Awareness of specific techniques	3.34	1.111	Moderate
Awareness of different IBS types	3.45	1.065	Moderate
Awareness of IBS benefits	3.47	1.127	Moderate
Awareness of IBS challenges	3.44	1.096	Moderate
PERCEPTION			
IBS can improve project efficiency	3.42	1.127	Moderate
The use of IBS can advance the country	3.44	1.112	Moderate
IBS leads to sustainable practices	3.43	1.091	Moderate
Poor craftsmanship in installation is a main issue	3.39	1.116	Moderate

(Interpretation Scale: 1.00-2.33 = Low; 2.34-3.67 = Moderate; 3.68-5.00 = High)

Correlation Between Awareness and Perception

A Pearson correlation analysis was conducted to examine the relationship between awareness of IBS benefits and the perception of its efficiency. The result in Table 3 shows a strong, positive, and statistically significant correlation ($r = 0.685$, $p < 0.01$).

Table 3

Correlation Analysis (N=907)

	Awareness of Benefits	Perception of Efficiency
Awareness of Benefits	1	0.685**
Perception of Efficiency	0.685**	1

** . Correlation is significant at the 0.01 level (2-tailed).

Discussion

This section discusses the implications of the findings based on the large-scale survey of 907 contractors. The results are interpreted by synthesizing them with the existing body of literature to provide a comprehensive understanding of the state of IBS adoption in Malaysia.

The State of IBS Adoption: A Moderate Awakening

The study's finding of a uniformly moderate level of awareness and perception (Mean scores ≈ 3.4) is a critical point of discussion. It suggests that despite years of promotion through initiatives like the IBS Roadmap 2011-2015 (CIDB, 2011), IBS has not yet fully penetrated the mindset of a large portion of contractors. While this indicates an improvement from a decade ago where awareness was a primary barrier, the current moderate stance reveals a level of industry-wide uncertainty or lack of deep conviction. This provides a more realistic explanation for the slow adoption rate, as it points to a foundational issue of incomplete buy-in from the industry.

The Compounded Challenge: Moderate Awareness and Practical Barriers

The "awareness-practice gap" is now seen in a new, more nuanced light. The challenge is twofold. First, the industry is still grappling with a moderate level of confidence. Second, this is compounded by significant practical barriers. The finding that contractors still perceive "poor craftsmanship in installation" as a key issue (Mean = 3.39) strongly corroborates the existing literature. This empirically supports the arguments made by previous researchers who identified a lack of a skilled workforce and technical expertise as a primary impediment to successful IBS implementation (Razali, 2016; Hamid et al., 2008). Therefore, our study confirms that this long-standing issue of a skills deficit remains a critical, unresolved barrier in the Malaysian construction industry.

The Strategic Path Forward: The Power of Benefit-Oriented Education

The correlation analysis provides the most significant new contribution of this study. While past research has extensively documented the barriers to IBS, the strong positive relationship ($r = 0.685$) between *awareness of benefits* and *perception of efficiency* offers a strategic insight into the psychological drivers of adoption. This finding suggests a path forward that moves beyond simply identifying problems. It implies that a contractor's confidence in IBS is directly linked to how well they understand its value proposition. This supports the notion that to overcome the practical challenges identified by researchers like Thanoon et al. (2003) and Razali (2016), the industry must first win the "hearts and minds" of its players. The results strongly suggest that future initiatives must focus on robustly communicating the tangible benefits of IBS, using evidence-based case studies to build the conviction needed for contractors to invest in overcoming the well-documented implementation hurdles.

Conclusion

This study provides a large-scale empirical assessment of IBS adoption among 907 Malaysian contractors. The primary conclusion is that the industry's progress towards full IBS adoption is hampered by a moderate, rather than high, level of awareness and positive perception. This moderate stance, coupled with persistent practical challenges like a perceived skills gap, creates a significant barrier to widespread implementation.

The research confirms that to close this gap, efforts must be strategically focused. The strong correlation between knowledge of benefits and perceived efficiency highlights the critical need for initiatives that go beyond technical awareness to champion the tangible advantages of IBS.

Recommendations

1. For Policymakers (CIDB): Develop targeted campaigns and case studies that showcase the clear financial and operational benefits of IBS to convince the undecided majority.
2. For Industry: Foster a culture of continuous learning focused not just on technical skills, but on understanding the business case for IBS adoption.
3. For Future Research: Further studies should explore the specific factors causing this moderate level of awareness and perception, perhaps through qualitative interviews, to uncover the root causes of the industry's hesitation.

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