



A Recent Study on Industrialized Building System (IBS) in Malaysian Construction Industry: A Systematic Review

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ABSTRACT

The construction sector has witnessed a significant increase in the use of Industrialized Building Systems (IBS) as a viable remedy for challenges related to productivity, cost effectiveness, and sustainability. Nevertheless, despite the increasing attention and extensive study conducted on this subject, there exists a significant requirement for a thorough and current evaluation of the most recent advancements in the field of Industrialized Building Systems (IBS). The primary aim of this systematic review is to fill in the current gaps in knowledge by undertaking a thorough examination of the current scientific literature and to give a thorough and up-to-date summary of the current research results on Industrialized Building Systems (IBS) in the Malaysian construction sector using a rigorous methodology that includes systematic search, screening, and synthesis. The expected outcomes are the recognition of developing patterns, inventive technology, and original methodologies in the application of IBS, along by a thorough analysis of their consequences and any obstacles. This article seeks to make a substantial contribution to the academic discussion on Industrialized Building Systems (IBS) by integrating the most recent findings. The final primary data was evaluated after a thorough search of the Scopus and Web of Science databases ($n = 23$). This systematic study aims to provide industry professionals, policymakers, and researchers with an understanding of the current advancements in the field. Furthermore, this study also aims to provide valuable insights for future research endeavours and practical implementations in the dynamic field of building.

1. Introduction

In the modern construction landscape, the adoption of innovative methodologies and practices is paramount to meet the ever-increasing demands for efficient, sustainable, and cost-effective construction solutions. The Industrialized Building System (IBS) is an example of a revolutionary method that has received significant attention [1]. IBS represents a paradigm shift in the construction

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industry by emphasizing the prefabrication of building components in controlled manufacturing environments [2-4]. This systematic review embarks on an exploration of IBS as a cornerstone of modern construction practices, aiming to comprehensively understand its implications, advantages, and challenges.

The construction sector is undergoing a remarkable evolution driven by the pressing need for accelerated project timelines, cost efficiencies, and reduced environmental impact [5,6]. IBS, by enabling the assembly of standardized building components at construction sites, has the potential to streamline construction workflows, enhance project quality, and reduce construction-related waste [7-10]. Therefore, it has garnered the interest of experts in the construction field, scholars, and politicians as a prospective resolution to the complicated problems faced by the sector.

Industrialized Building System (IBS), on the other hand, epitomizes the paradigm shift toward prefabrication and modular construction methodologies. IBS leverages standardized components and assembly techniques to enhance construction efficiency, reduce wastage, and improve quality control [11,12]. The systematic integration of prefabricated elements minimizes on-site disruptions, accelerates project timelines, and fosters sustainable construction practices [13]. IBS's capacity to tackle traditional construction challenges while aligning with sustainable principles underscores its significance in the contemporary construction discourse [14,15]. Figure 1 display the number of all construction project which include public and private sectors. The highest construction project is in 2019 accounting for 9907 projects.

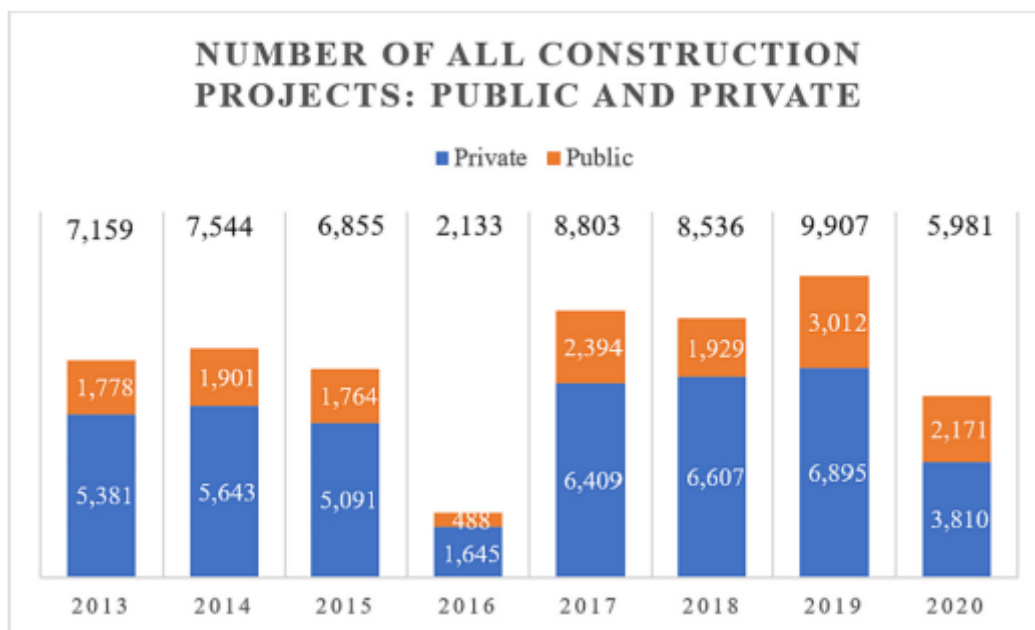


Fig. 1. Annual construction projects in both the public and private sectors [16]

The housing shortages in Malaysia due to conventional construction methods and the promotion of the Industrialized Building System (IBS) is discussed as a solution. However, industry fragmentation hinders the effectiveness of IBS [16]. To address this issue, a collaborative approach rooted in supply chain management has been proposed, but its implementation remains limited, especially in the private sector [16]. A stakeholder-involved research identified critical success factors for IBS adoption, which led to a conceptual framework outlining the necessary implementation planning phases [17].

Modular construction, which is synonymous with IBS, is an innovative method in Malaysia's construction industry that offers advantages such as accelerated project schedules, adherence to superior quality standards, and reduced wastage [18]. Nonetheless, the extensive use of this approach is impeded by deficiencies in understanding and insufficient readiness [19]. The efficacy of modular construction is contingent upon the efficient management of transportation, a factor that is influenced by various elements such as module dimensions, types of trailers, road rules, route selection, timing, and technology [20]. The objective of the research is to provide stakeholders with valuable insights regarding modular construction transportation and IBS implementation, presenting a novel procurement methodology based on the Design and Build approach to improve the IBS construction process, which may result in cost and time savings [21].

In their study, Alawag *et al.*, [22], emphasize that leadership plays a crucial role in affecting quality control in IBS construction projects in Malaysia. The focus of the study is on comprehending key variables associated with the implementation of quality management, which is essential for effective project execution within the context of IBS [23]. In Malaysian IBS construction projects, quality management assures benefits such as enhanced operational effectiveness, increased customer satisfaction, increased cooperation, profitability, and increased safety precautions. Focusing on financial, policy, technical, managerial, stakeholder, and perception-related aspects, the study investigates further the obstacles associated with IBS implementation in Malaysia. To mitigate challenges and promote sustainable building practices by nurturing flexible design principles within the Malaysian IBS context, strategies involving advanced design principles and increased IBS manufacturing on a national scale are suggested.

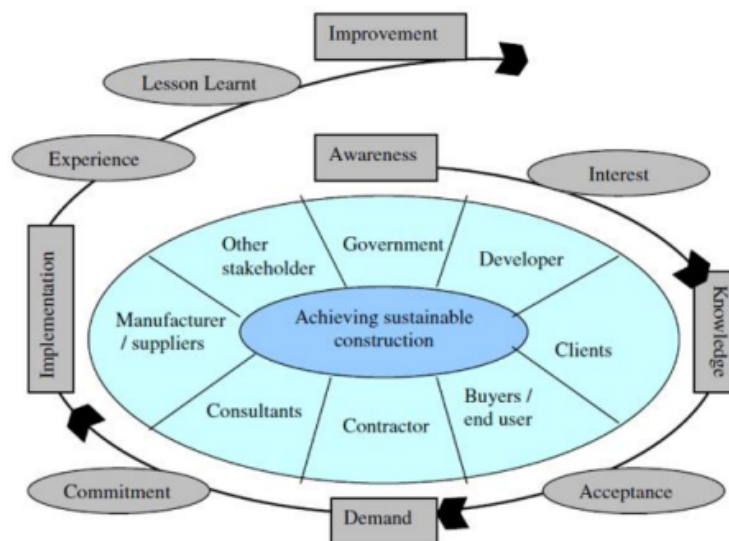


Fig. 2. The pathway to attaining sustainable building [24]

The present systematic analysis was formulated with the objective of addressing the primary research inquiry: What is the most up-to-date body of research pertaining to the adoption of Industrialized Building Systems (IBS) within the construction industry, and what are the implications of IBS implementation on sustainability and quality? The current study undertaken within the construction industry holds considerable significance in addressing prevailing challenges, embracing technological advancements, and ensuring that construction practices align with contemporary environmental, safety, and economic requirements. It enables the promotion of positive change and development within an industry that holds a crucial position in the progress of societies on a worldwide scale.

2. Methodology

2.1 Identification

This paper is focusing on Malaysian construction industry since the Malaysian construction sector has been actively advocating for the adoption of IBS as a means to address key challenges related to productivity, cost-effectiveness, and sustainability. The process of selecting relevant papers for this investigation was conducted utilizing the systematic review methodology, which has three essential components. Utilizing lexical resources such as vocabularies, dictionaries, encyclopaedias, and existing scholarly investigations, the initial stage involves the identification of pivotal terms and the exploration of associated, interconnected expressions. After the completion of the selection process for relevant terms, search strings were generated for the Scopus and Web of Science databases, as outlined in Table 1. In the preliminary phase of the systematic review procedure, the present study project successfully identified a total of 278 publications from the designated databases.

Table 1

The search strings

Scopus	TITLE-ABS-KEY ("industrialized building system") AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English"))
Web of Science	"industriali*ed building system" AND "construction industry" (All Fields) and 2023 or 2022 or 2021 (Publication Years) and Article (Document Types) and English (Languages) and Article (Document Types) and English (Languages) and 2023 or 2022 or 2021 (Publication Years)

2.2 Screening

During the preliminary evaluation, duplicate manuscripts were deemed ineligible. Based on the varying exclusion and inclusion criteria employed by the experts, the initial phase of the inquiry dismissed a total of 234 articles, however the subsequent step assessed only 8 papers. The initial criteria employed was literature, namely research articles, as it serves as the principal source of valuable recommendations. Furthermore, the scope of the review was limited to publications written in the English language. Keep in mind that the plan was developed for the most recent three-year timeframe (2021-2023). In all, a disqualification of 234 publications occurred, in accordance with pre-established criteria.

2.3 Eligibility

The eligibility level, denoted as the third level, comprises a total of 36 components. In order to ascertain the fulfilment of the inclusion criteria and the relevance of the papers to the research objectives of the present study, a meticulous examination of the article titles and important content was conducted at this juncture. Consequently, a total of 13 publications were omitted from the analysis as a result of their limited availability of full text and their titles and abstracts being regarded irrelevant, unimportant, or unconnected to the study's objectives. A cumulative sum of 23 publications is presently undergoing assessment, as evidenced by the data presented in Table 2.

Table 2
 The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2021 – 2023	< 2021
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

2.4 Data Abstraction and Analysis

The present study utilized an integrative evaluation methodology to assess and consolidate several research designs, specifically focusing on quantitative approaches. The main objective of the master's program was to identify prominent characteristics and subcategories. The preliminary stage of gathering information constituted the fundamental step in the progression of the subject's growth. Figure 3 illustrates the authors' thorough analysis of a comprehensive collection of 23 published works to identify relevant claims or content related to the topics investigated in the present study.

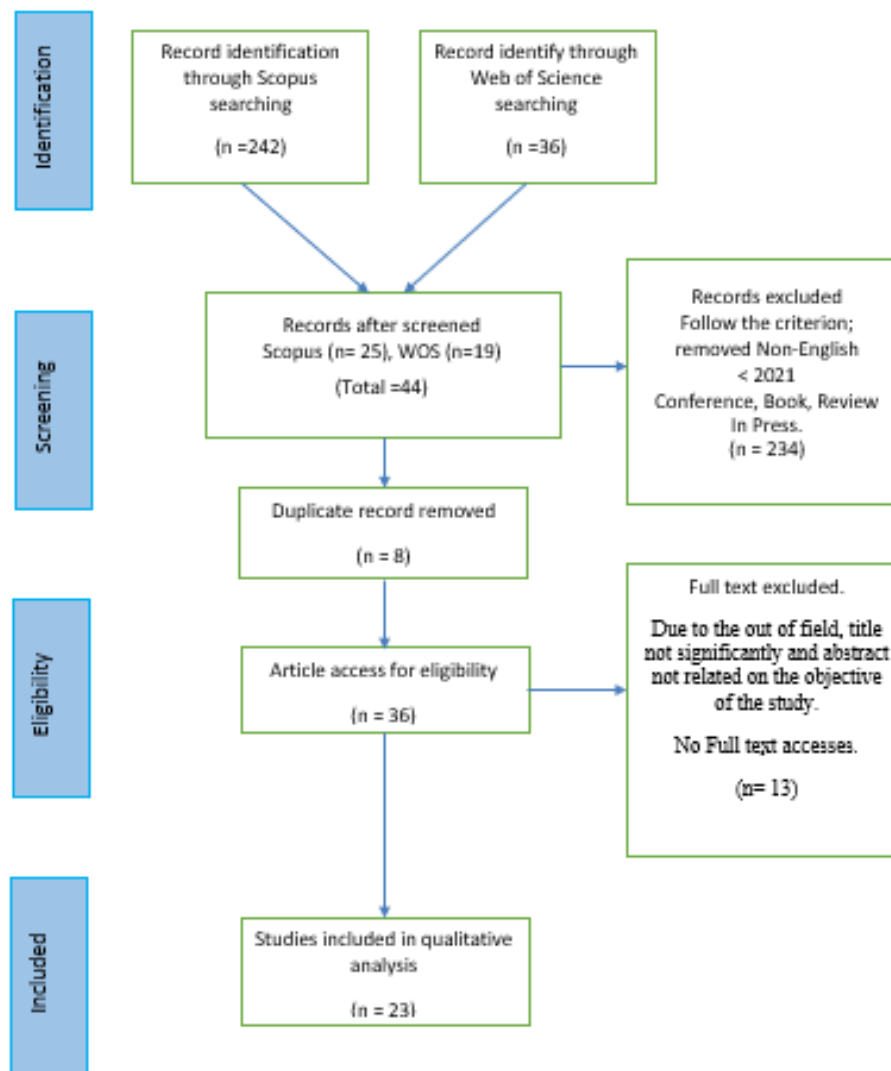


Fig. 3. Flow diagram of the proposed search study [28]

3. Results

The Malaysian government has been actively promoting the adoption of Industrialised Building Systems (IBS) within the construction industry, aiming to enhance operational efficiency, reduce construction timelines, and elevate the overall quality of constructed buildings. IBS involves the manufacturing of building components or modules in a controlled environment, followed by on-site assembly. In our comprehensive analysis, we extracted and scrutinized 23 articles using the specified search methodology. These articles focus on research papers published within the last three years to ensure the inclusion of the most up-to-date and relevant information, as research fields evolve rapidly and it allows for the incorporation of emerging trends and innovations, demonstrating awareness of the field's latest developments. While recent research is prioritized, acknowledging and referencing older, foundational work may still be necessary. These articles were categorized into three primary themes, namely challenges and solutions (11 articles), sustainability and environmental practices (5 articles), and quality and efficiency (7 articles), as detailed in Table 3.

Table 3

The research article finding based on the proposed searching criterion

No.	Authors	Journal	Title	Scopus	WOS	Remarks
1	Nawi <i>et al.</i> , [29]	Journal of Advanced Research in Applied Sciences and Engineering Technology (2023)	Expert Perspective on The Barriers and Enablers of Joint Effort and Technological Collaboration Among Malaysian Industrialized Building System (IBS) Housing Project Supply Chains	/		Challenges and Solutions
2	Alawag <i>et al.</i> , [9]	Revista De La Construccion (2023)	Implementation of Total Quality Management (TQM) In Malay-Sian Industrialized Building System (IBS) Projects	/	/	Quality and Efficiency
3	Sahimi <i>et al.</i> , [30]	Malaysian Construction Research Journal	Assessing Predicting Factors: Good Management Practices Towards the Successful Implementation of Green Supply Chain Management (GSCM) In IBS Construction Project	/	/	Sustainability and Environmental Practices
4	Gunasagaran <i>et al.</i> , [31]	Journal of Engineering Science and Technology	Integrating System Thinking in Industrialised Building System (IBS) In Malaysia	/		Quality and Efficiency
5	Abdullah N. <i>et al.</i> , [32]	ASM Science Journal (2021)	Perception Analysis of Industrialized Building System (IBS) Implementation for G7 Contractors in Kuching, Sarawak	/	/	Challenges and Solutions
6	Saad <i>et al.</i> , [33]	Ain Shams Engineering Journal (2022)	Identification of Critical Success Factors for The Adoption of Industrialized Building System (IBS) In Malaysian Construction Industry	/	/	Challenges and Solutions
7	Fateh, Mohammad [34]	International Journal of Sustainable Construction Engineering and Technology (2021)	The Framework of Factors for The Improvement of The Significant Clauses in The Standard Form of Contract for The IBS Construction Approach in Malaysia	/	/	Quality and Efficiency

8	Kasim <i>et al.</i> , [35]	Malaysian Construction Research Journal (2021)	Impact of Covid-19 On IBS Implementation in Housing Construction Projects	/	/	Challenges and Solutions
9	Len <i>et al.</i> , [36]	International Journal of Sustainable Construction Engineering and Technology (2021)	Investigating Significant Issues of BIM Implementation in Industrialised Building System Design and Production Process	/	/	Challenges and Solutions
10	Hobees <i>et al.</i> , [37]	Webology (2021)	Facilities Management (FM) In Industrialized Building System (IBS) Projects in Malaysia: Challenges and Strategies for Improvement	/	/	Quality and Efficiency
11	Mohsen <i>et al.</i> , [8]	Ain Shams Engineering Journal (2023)	Critical Success Factors Influencing Total Quality Management in Industrialised Building System: A Case of Malaysian Construction Industry	/	/	Quality and Efficiency
12	Aknam, Amtered [38]	Architectural Engineering and Design Management Journal of Engineering Science and Technology (2022)	Economic Effects of Migrant Labour on Industrialized Building System (IBS) Adoption in The Malaysian Construction Industry	/	/	Challenges and Solutions
13	Soon <i>et al.</i> , [21]	Journal of Engineering Science and Technology (2022)	The Proposed Framework of Procurement System for Industrialised Building System (IBS) Projects in The Malaysian Construction Industry	/		Sustainability and Environmental Practices
14	Muhammad <i>et al.</i> , [39]	International Journal of Sustainable Construction Engineering and Technology (2023)	Efficient Construction Waste Management: A Solution through Industrial Revolution (IR) 4.0 Evaluated by AHP	/	/	Sustainability and Environmental Practices
15	Alias, Muhamad [40]	Journal of Advanced Research in Applied Sciences and Engineering Technology (2021)	Industrialized Building System Evaluation Framework for Highway Construction in Malaysia	/	/	Sustainability and Environmental Practices
16	Al-Aidrous <i>et al.</i> , [41]	Ain Shams Engineering Journal (2023)	Major Blocking Factors Affecting the Application of Industrialized Building System	/	/	Challenges and Solutions
17	Saad <i>et al.</i> , [33]	Ain Shams Engineering Journal (2022)	Identification of Critical Success Factors for The Adoption of Industrialized Building System (IBS) In Malaysian Construction Industry		/	Challenges and Solutions
18	Alawag <i>et al.</i> , [8]	Ain Shams Engineering Journal (2023)	Critical Success Factors Influencing Total Quality Management in Industrialised Building System: A Case of Malaysian Construction Industry		/	Quality and Efficiency
19	Alaloul <i>et al.</i> , [17]	Arabian Journal for Science and Engineering (2023)	Last Planner System (LPS) Themed Framework for Effective Application of Industrialized Building System (IBS)		/	Challenges and Solutions

20	Alawag <i>et al.</i> , [42]	Revista De La Construccion (2023)	Implementation of Total Quality Management (TQM) In Malay-Sian Industrialized Building System (IBS) Projects	/	Quality and Efficiency
21	Al-Aidrous <i>et al.</i> , [41]	Ain Shams Engineering Journal (2023)	Major Blocking Factors Affecting the Application of Industrialized Building System	/	Challenges and Solutions
22	Abd Razak <i>et al.</i> , [22]	Buildings (2022)	The Role of The Total-Quality-Management (TQM) Drivers in Overcoming the Challenges of Implementing TQM In Industrialized-Building-System (IBS) Projects in Malaysia: Experts' Perspectives	/	Sustainability and Environmental Practices
23	Pervez <i>et al.</i> , [43]	Plos One (2022)	Evaluation of Critical Risk Factors in The Implementation of Modular Construction	/	Challenges and Solutions

3.1 Challenges and Solutions in IBS Implementation in Malaysia

Multiple key difficulties and corresponding solutions have been identified through various research studies pertaining to the implementation of Industrialized Building Systems (IBS) within the building industry of Malaysia. The safety and health performance of the construction sector has been recognized as a significant concern, as indicated by publications that emphasize the necessity for substantial enhancements in site safety [25]. In order to tackle this issue, there is a call for the identification and examination of potential dangers and risks associated with different construction procedures, encompassing both Industrialized Building Systems (IBS) and conventional methods. The objective of this endeavour is to enhance the overall health and safety conditions at construction sites [26,27]. Moreover, it is recommended that a comprehensive risk assessment be conducted before to commencing building activities in order to mitigate any hazards.

Another issue is the Malaysian housing problems [44]. Compounded by the dominance of traditional construction methods, have prompted the promotion of IBS as a solution. However, industry fragmentation has hampered the effectiveness of IBS adoption. The proposed method entails joint effort and technological collaboration using Supply Chain Management concepts. Nonetheless, concerns of commitment have been noted as a significant impediment to the implementation of these collaborative initiatives, emphasizing the need of industry participants' desire to accept change and adapt to new technology.

Malaysian IBS uptake has historically been plagued by research costs. Contractors think IBS boosts production but doubt it cuts costs. IBS implementation costs have increased due to stakeholder miscommunication, notably during design [45]. These cost difficulties can be addressed with government and business promotions and help.

The utilization of Building Information Modelling (BIM) technology as a catalyst for Industrialized Building System (IBS) in Malaysia has encountered challenges throughout the design phase [46,47]. In order to fully capitalize on the advantages of Building Information Modelling (BIM) in the Industrialized Building System (IBS) industry, it is imperative to establish early collaboration between IBS businesses and project stakeholders, while also ensuring the expertise of these stakeholders in IBS design and installation.

Next, migrant labour economic issues such labour costs, project prices, labour availability, and project competition have boosted IBS implementation in Malaysia. These factors can inform construction stakeholders' IBS adoption decisions by creating personnel standards.

While the global construction industry rapidly experiments with industrialised and modular construction technologies, Malaysia has struggled to scale up IBS usage. High capital costs, specialised design, and transportation expenses are critical restraints. Standardised design standards and a larger IBS manufacturer network can solve these issues.

Moreover, the essential factors for achieving success in the application of Integrated Building Systems (IBS) in Malaysia's construction sector encompass stakeholder awareness, resource availability, process management, challenges and perceptions, and future demands [48]. The successful implementation of IBS deployment relies on several crucial factors, namely the augmentation of skilled workforce, enhancement of operational capacities, and mitigation of negative societal attitudes.

In conclusion, the adoption of IBS in Malaysia encounters numerous obstacles, including safety concerns, cost challenges, collaboration issues, technological acceptance, and economic considerations. A comprehensive approach involving government intervention, corporate sector involvement, and cooperation among construction industry stakeholders is imperative to promote the efficient and widespread usage of IBS in Malaysia and on an international scale.

However, there were opportunities to enhance the depth and breadth of research by incorporating quantitative data and statistical analysis from previous studies, providing a more rigorous perspective. Case studies of specific IBS projects in Malaysia offered concrete examples of challenges and their resolutions. Research can be done on the long-term effects of IBS adoption, including its impact on safety, cost, and efficiency over time, providing valuable insights. Environmental sustainability aspects and the role of government policies can also be explored. Examined the viewpoints and experiences of various stakeholders, the role of technological advancements, and the influence of social and cultural factors on IBS acceptance. A comparative analysis with other countries or regions facing similar or different challenges offered valuable lessons.

3.2 Impact of IBS on Sustainability and Environmental Practices

Successful IBS adoption in Malaysia requires addressing IBS implementation issues and solutions. Thus, this section will discuss IBS's effects on sustainability and the environment. Malaysia's building sector can improve sustainability and environmental practises by using Industrialised Building Systems (IBS). Numerous studies have examined IBS adoption and its effects on various construction industry sectors.

Research is underway to integrate Green Supply Chain Management (GSCM) practises into IBS building projects to promote environmental sustainability and green principles. Effective managerial techniques are strongly correlated with Green Supply Chain Management (GSCM) adoption. This association may help IR 4.0 supply chain management digitization [49].

Furthermore, a recent analysis underscores the transition of the building business in Malaysia towards the adoption of Industrialised Building Systems. The recognition of this transition stems from the adoption of Integrated Business Systems (IBS), which has been shown to enhance various aspects such as quality, cost-effectiveness, safety, waste reduction, and productivity. The deployment of integrated building systems (IBS) has been impeded by conventional procurement practices, leading to inadequate funding, limited integration, and reduced effectiveness.

Building waste management and its environmental impacts are serious issues in Malaysia. The research shows that insufficient disposal practises cause typical construction procedures to produce a lot of waste, despite efforts to reduce it. Due to its capacity to reduce building waste and material costs, IBS is a sustainable solution. The report emphasises the government's role in promoting Industrialised Building Systems (IBS) to reduce building waste and promote sustainability.

Due to controlled production procedures and reduced on-site activity, IBS promotes sustainability. However, most IBS research has focused on buildings, leaving roadway construction unexplored. To fill this knowledge vacuum, a system for evaluating highway structural works' IBS implementation has been developed. The framework's main goal is to improve highway construction's systematic and coordinated use of Industrialised Building System (IBS) components. This framework supports the government's sector IBS adoption goals.

Finally, Industrialised Building Systems (IBS), prefabrication, and Design for Manufacturing and Assembly (DfMA) are examined to promote construction industry innovation [50]. Despite showing promise, these methods have not yet achieved their maximum potential. The utilization of Design for Manufacture and Assembly (DfMA) is a prevalent approach employed to enhance construction performance. Further investigation is required to gain a comprehensive understanding of the application of this technology within the construction industry.

From the review, the impact of Industrialized Building Systems (IBS) on sustainability and environmental practices in the Malaysian construction industry provides valuable insights. However, future research can be considered delving deeper into quantifiable environmental benefits, examining social and economic aspects of sustainability, highlighting evolving trends and policies, and showcasing case studies of successful IBS projects with a strong sustainability focus. This would offer a more comprehensive understanding of IBS's contribution to sustainability in Malaysian construction, enriching research and providing a holistic view of the subject.

3.3 Enhancing Quality and Efficiency in Construction

In Malaysia, the integration of quality management with Industrialized Building Systems (IBS) holds substantial potential for enhancing quality and efficiency in the construction industry. Multiple research studies have explored different facets of this integration, shedding light on its benefits and challenges.

Another research effort delves into the limitations of IBS in terms of design flexibility and architectural innovation. While IBS offers numerous advantages, its modular nature can restrict architectural creativity [51]. The study aims to improve architects' perception of IBS by incorporating systems thinking into the design process. By adopting a quantitative method, the research seeks to identify system thinking concepts that can facilitate more flexible and innovative design practices when using IBS. This approach aims to address the challenges associated with limited design flexibility within IBS projects in Malaysia.

In addition, facilities management plays a crucial role in project success, offering benefits such as a better working environment, cost management, and efficient maintenance [37]. The research explores the advantages and challenges of performing facilities management in IBS projects compared to conventional construction. While IBS projects may require higher quality and lifelong services, they also offer advantages in terms of quicker maintenance. The study underscores the need to carefully consider these factors when planning FM in IBS projects to optimize their advantages.

Furthermore, the significance of quality management in construction projects utilizing Industrialized Building Systems (IBS) in Malaysia is underlined in a separate research study. This study aims to identify and assess the key success elements that have a significant impact on quality management in the context of Integrated Business Systems (IBS). The aspect that stands out as the most significant in a group setting is leadership, as all contributing factors show a notable impact on the successful performance of a project. This study emphasizes the crucial significance of quality management in guaranteeing both quality and efficiency in IBS initiatives.

In summary, these research studies collectively emphasize the potential benefits of integrating quality management with IBS in Malaysia's construction industry. They underscore the need for greater awareness, improved contractual frameworks, and careful consideration of design and facilities management to unlock the full potential of this integration, ultimately enhancing quality and efficiency in construction projects.

Nevertheless, to further enrich research, consider delving deeper into the role of technology, such as Building Information Modelling (BIM), in quality management within IBS projects, analysing the economic aspects of quality and efficiency, highlighting emerging trends and best practices, and exploring case studies of successful IBS projects that effectively integrated quality management principles. By incorporating these dimensions, systematic review can offer a more comprehensive and practical understanding of how quality and efficiency improvements are achieved in the context of IBS adoption in Malaysia.

4. Conclusions

To summarize, Malaysia's construction industry has deliberately used Industrialized Building Systems (IBS) to meet multifarious obstacles and capitalize on possible opportunities. Comprehensive risk assessments are believed necessary to mitigate possible dangers and establish a safety-centric culture, with safety and health being prioritized. In order to address the challenge posed by industry fragmentation, it is necessary to implement collaborative projects and foster technology synergy. In order to address cost-related concerns pertaining to Industrialised Building System (IBS), many approaches have been recommended, including government incentives and industry-driven cost-effective procedures.

In addition, it is crucial to note that the utilization of Building Information Modelling (BIM) technology plays a significant role in optimizing the implementation of Industrialized Building Systems (IBS), notwithstanding the obstacles encountered during the design process. The establishment of early collaboration among players in the IBS sector, coupled with a heightened understanding of IBS design and execution, has significant importance. In order to promote the general use of IBS (Industrialized Building Systems), it is important to employ standardized design principles and expand the current production network for IBS.

Throughout the research, we identified three key themes on a recent study on IBS in Malaysian construction, which are obstacles and solutions in IBS implementation, the impact of IBS on sustainability and environmental practises, and boosting quality and efficiency in construction. It is critical to develop collaboration among governmental authorities, corporate groups, and the building sector in order to facilitate the successful use of IBS. A skilled staff, the potential to improve capabilities, and current public sentiments are all key success factors. The implementation of a comprehensive strategy promotes the active involvement of stakeholders and incorporates quality management principles into the practise of Integrated Building Systems (IBS), thereby enhancing both construction productivity and quality. The implementation of these measures will result in enhanced project outcomes.

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