A Comparative Analysis of Industrialized Building Systems (IBS) and Conventional Construction Methods (CCM) In Port Harcourt, Nigeria

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ABSTRACT

This study provides a comparative evaluation of industrialized building systems and conventional construction methods in Port Harcourt, Nigeria, emphasizing their structural components, cost frame works, time–cost efficiency and implementation challenges. A descriptive research approach was adopted, utilizing a structured questionnaire administered to professionals across both public and private construction sectors in Port Harcourt including engineers, architects, contractors, quantity surveyors, project managers and builders. The study employed both primary and secondary data sources. Out of seventy (70) distributed questionnaires, sixty (60) was duly completed and deemed valid for analysis. Descriptive statistics such as mean and standard deviation was used to analyze the data with the help of statistical package for social sciences (SPSS version 25.0). The findings indicate that industrialized building systems projects utilized standardized, prefabricated components such as beams, panels and slabs manufactured under controlled factory conditions, in contrast to labor intensive, on site processes characterized by conventional construction. The result further review that industrialized building systems achieve superior time-cost performance, reducing project duration approximately 40–50% compared to conventional methods. Nevertheless, the wide spread adoption of industrialized building systems in port Harcourt is hindered by factors such as insufficient technical expertise, high initial set up costs, weak government policy support, poor infrastructure for transporting prefabricated components and cultural resistance for to modern construction system. The study concludes by recommending that construction stakeholders should adopt a hybrid strategy that merges the efficiency of prefabrication with the adaptability of conventional methods, while both government agencies and private developers should undertake a comprehensive cost benefit analyses prior to selecting an appropriate construction approach.

Keywords: Industrialized building system, conventional construction, cost efficiency, time management, Port Harcourt.

INTRODUCTION

The construction sector serves as a cornerstone of economic progress in developing nations such as Nigeria, contributing notably to the national GD and employment opportunities. Despite its importance, Nigeria's reliance on conventional construction methods has long been associated with persistent challenges, including frequent project delays, excessive material waste, poor quality control, escalating costs, and inefficiencies in labor management (Oladokun & Gbadegesin, 2017). In response to these limitations, increasing attention has been directed towards the adoption of industrialized building systems a modern approach that emphases offsite prefabrication, mechanization, and standardization of building components as a viable alternative for enhancing construction performance (Nawi, Lee, & Nor, 2018). Although industrialized building system has shown potential to boost productivity, reduce project timelines, and support sustainable practices, its adoption in Nigeria remains relatively low (Ede, 2014). Port Harcourt, the economic center of Rivers State, exemplifiers this scenario, as rapid urbanization and cost effectives construction solutions. Nonetheless, most firms in the area continue to depend on conventional, labor intensive, and site based construction techniques (Ogunbayo et al., 2020). Comparative analyses between industrialized building systems and conventional construction methods consistently reveal that industrialized building systems provide superior outcomes in quality control, cost predictability, and environmental performance (Yong, Sapuan, & Hamid, 2019). Because industrialized building system components are manufactured under controlled factory conditions, they ensure greater precision and reduced material wastage compared to traditional on-site processes. Furthermore industrialized building system enhances project delivery seed and supports sustainable construction by carbon emissions and optimizing resources utilization (Zawawi et al., 2021). Nevertheless, several barriers such as high initial investment costs, insufficient technical expertise, lack of standardized practice, and cultural resistance within the local construction community continue to impede its scale implementation in Nigeria Babatunde & Opawole, 2018). Port Harcourt thus offers a relevant context for examining the comparative performance of industrialized building system and conventional methods, particularly regarding cost efficiency, construction speed, labor productivity, quality assurance, and environmental sustainability. Gaining insights into these dimensions is crucial for shaping policy frameworks, fostering innovations, and promoting sustainable construction in Nigeria's built environment (Adewuyi & Odesola, 2020). Consequently, this study seeks to conduct a comparative analysis of industrialized building systems and conventional construction methods in Port Harcourt, Nigeria. Its specific objectives are to: identify and describe the key components and processes involved in both industrialized building systems and conventional construction methods, compare the direct and indirect costs associated with both methods, evaluate the time-cost efficiency of industrialized building systems and conventional construction and examine the challenges hindering the implementing of industrialized building systems in Port Harcourt.

Concept Of Industrialized Building System (IBS)

The industrialized building system represents a modern construction approach that employs industrial production methods to manufacture building components, which are subsequently transported to the site for assembly. This technique seeks to enhance construction quality, efficiency, and productivity (Warszawski, 1999). Rahman and Omar (2006) highlights that industrialized building system is defined by its reliance on prefabrication, mechanization and automation all crucial for achieving sustainable and affordable delivery. Conversely, conventional construction methods depend largely on manual, on-site operation, where structures are built directly in place. Although conventional construction methods offers flexibility and adaptability, it often leads to increased labor expenses, material wastage, and schedule delays (Ajayi et al., 2019). In Nigeria, the adoption of industrialized building system is still at an early stage. The construction industry remains dominated by conventional methods due to limited awareness, insufficient technical expertise and weak policy frameworks (Babatunde & Opawole, 2018). Nevertheless, growing research indicates increasing acknowledgement of industrialized building system potential to improve project outcomes and reduce the national housing shortage (Ogunbayo et al., 2020). Ede (2014) emphasizes that chronic inefficiencies in Nigeria's construction sector such as project delay, poor quality, and cost escalation could be mitigated through effective industrialized building system implementation. However, obstacles such as high initial capital requirements, lack of standardized systems and dependence on imported technology continue to impede its widespread use (Emma-Ochu & Onwuka, 2018). Empirical studies in Port Harcourt by Ogunbayo et al. (2020) and Adewuyi & Odesola (2020) shows that traditional methods remain preferred due to their affordability and familiarity. Yet, pilot project utilizing industrialized building system demonstrated superior quality control and faster completion times. Similar findings were observed in Lagos, Abuja and Kano (Raji, 2023), indicating that industrialized building system could be successfully scaled across Nigeria's major urban centers if institutional and financial constraints are effectively addressed.

Components and Processes Involved in Industrialized Building System and Conventional Construction Methods

Industrialized building systems and conventional methods represent two fundamental different approaches within the construction sectors, each characteristics by distinct processes, components and philosophies of operation, industrialized building system focuses on prefabrication, mechanization and production efficiency while conventional construction methods is grounded in manual, site-based craftsmanship and a step by step construction workflow (Abdul Kadir et al., 2006; Nawi et al., 2018). In industrialized building system, most structural elements are designed and manufactured off site under controlled factory conditions before being transported to the construction location for assembly. These components often include precast concrete beams, columns, slabs, wall angels, and staircases, along with steel frames, modular units, and prefabricated wall systems (Yong et al., 2019; Zawawi et al., 2021). The use of standardized, modular components promotes precision, quality consistency, and faster project delivery which is a key advantage of industrialized building systems (Babatunde & Opawole, 2018). The industrialized building systems process typically follows a structured workflow that includes design and standardized, off site fabrication, transportation and logistics, on site assembly, finishing and integration, and quality control (Nawi et al., 2018). During the design phase, digital technologies such as Computer Aided Design and Building Information Modeling are utilized to produce highly accurate and interoperable designs (Yong et al., 2019). In view of the practical support, building information modeling which is a technological tools that enables various construction stakeholders for project planning, design, coordination and to enhance construction project delivery more effectively and efficiently (Kelechi, Amadi, Chinemerem, 2025). Off-site fabrication then ensures consistent quality and minimizes structural defects through factory based production (Zawawi et al., 2021). Components are subsequently transported to the construction site for assembly using cranes and other heavy equipment, involving techniques such as bolting, welding, or mechanical fastening, with minimal wet works required. The process concludes with finishing, service integration for example electrical and plumbing installations, and rigorous quality checks to ensure compliance with performance and safety standards (Adewuyi & Odesola, 2020). According to Abdul Kadir et al. (2006), this industrialized process enables concurrent off-site manufacturing and on site preparation, leading to significant time savings and improved overall efficiency. Moreover, industrialized building systems supports sustainability objectives by optimizing material use, reducing waste, and lowering carbon emissions (Zawawi et al., 2021). Despite its many advantages, industrialized building systems adoption in developing contests such as Nigeria remains limited due to high initial investment costs, insufficient technological infrastructure, and a shortage of skilled professionals (Emma-Ochu & Onwuka, 2018). On the other hand, conventional construction methods depend on the on-site production and assembly of all building elements using local materials and labor. Major components include in-situ reinforced concrete (foundations, beams, columns, and slabs), masonry walls, and timber or steel roofing systems (Oladokun & Gbadegesin, 2017).

Direct and Indirect Costs Associated With Industrialized Building System And Conventional Construction Methods

Specifically, construction project costs are generally classified into two main categories which is direct and indirect costs which differ significantly between industrialized building systems and conventional construction methods. Direct costs encompass expenses that can be directly linked to specific construction task, such as material, labor, and equipment. Indirect cost, by contrast, refers to supporting expenditures like administration, supervision, and depreciation that facilitate project execution but cannot be attributed to individual activities (Abdul Kadir et al., 2006; Oladokun & Gbadegesin, 2017). The cost composition of industrialized building system and conventional construction methods varies due to their distinct operational philosophies. Industrialized building system emphasizes prefabrication and mechanization, while conventional construction methods relies primarily on manual, on-site processes (Babatunde & Opawole, 2018; Yong et al., 2019). Material expenses arise mainly from prefabricated components such as precast concrete, steel frames, and modular units, which are costlier than conventional materials owing to stringent quality control and factory based production (Adewuyi & Odesola, 2020). However, these cost are offset by reduced waste, higher precision, and fewer rework needs during assembly (Zawawi et al., 2021). Labor in industrialized building system involves hiring specialized professionals engineering, BIM technicians, and crane operators resulting in higher hourly wages despite smaller workforce requirements (Nawi et al., 2018). Equipment and machinery costs also form a large portion of expenses since industrialized building system depends on crane, precast molds, factory automation systems, and heavy duty transport (Emma-Ochu & Onwuka, 2018). In contrast, conventional construction methods is dominated by manual labor, on-site material use, and prolonged construction durations. Direct costs typically include materials like cement, sand, gravel, and timber, which are locally sourced but prone to wastage due to poor storage and handling (Oladokun & Gbadegesin, 2017). Other direct costs stem from temporary site facilities, utilities, and security measures needed throughout the project (Oladokun & Gbadegesin, 2017).

Time–Cost Efficiency Of Industrialized Building Systems And Conventional Construction Methods

Time–cost efficiency plays a pivotal role in assessing the overall success and practicality of any construction approach. It describes how effectively a system meets project goals completing work within the set budgets and schedules without compromising quality. The performance of industrialized building systems and conventional construction methods differs greatly due to variation in their operational frameworks, technology integration, and reliance on manual labor (Abdul Kadir et al., 2006; Yong et al., 2019). In industrialized building system, efficiency is driven by prefabrication, standardization, and concurrent construction processes that enable off site component production while on site preparations occur simultaneously. Components such as beams, slab, and panels are fabricated in controlled environments, reducing errors and rework, while foundations are laid on-site. This parallel workflow considerably reduces construction time compared to the sequential nature of conventional construction methods Nawi et al., 2018). Studies indicate that industrialized building system can shorten project completion time by 30–50% compared to conventional construction methods, as off-site production limits weather disruptions and decreases dependence on site labor (Yong et al., 2019). Standardization and repetition in industrialized building system generate economies of scale, particularly beneficial for large housing developments where increased production lowers per unit costs (Emma-Ochu & Onwuka, 2018). In densely populated areas such as Port Harcourt, industrialized building system also provides time benefits by mitigating challenges linked to labor shortage, traffic, and environmental constraints. However, industrialized building systems requires substantial upfront investment for factory setup, specialized equipment, and skilled labor (Adewuyi & Odesola, 2020). In contrast, conventional construction methods depends heavily on manual, site based and sequential operations, resulting in extended project timelines and higher overall costs. Each construction phase foundation, walling, roofing, and finishing occurs in succession, lengthening completion time (Oladokun & Gbadegesin, 2017). These methods are susceptible to delays caused by weather, labor inefficiencies, and material shortages (Babatunde & Opawole, 2018).

Challenges hindering the Implementing of Industrialized Building Systems in Port Harcourt, Nigeria

Implementing industrialized building systems in Port Harcourt presents considerable advantages but also encounters notable obstacles that affect its overall acceptance and effectiveness in the construction sector. One of the main advantages of industrialized building system is its ability to significantly accelerate project completion through off site prefabrication, allowing simultaneous manufacturing and on-site operations. This integration can reduce construction timelines by as much as 50% when compared to conventional building methods (Abdul Kadir et al., 2006; Nawi et al., 2018). From a financial standpoint, industrialized building system enhances long term cost efficiency through reduced labor reliance and the realization of economies of scale, particularly in large construction projects (Babatunde & Opawole, 2018). Environmentally, it supports sustainability goals by generating less on site waste and improving the use of resources an important consideration in an industrial hub like Port Harcourt (Adewuyi & Odesola, 2020). This system also improve construction safety, as much of the work occurs in factory environments, thus lowering the risk of on-site accidents and promoting better workers welfare (Yong et al., 2019). However, several challenges hinder the widespread implementation of industrialized building system in Port Harcourt. The most significant barrier is the substantial initial investment needed for setting up prefabrication facilities, purchasing specialized machinery, and training skilled labor. This high entry cost often prevents small and medium sized construction firms from participating (Adewuyi & Odesola, 2020). Another key issue is the shortage of professionals proficient in industrialized construction techniques, as many local contractors still rely heavily on traditional practices (Emma-Ochu & Onwuka, 2018). Infrastructure constraints such as inadequate transportation networks and logical bottlenecks further complicate the delivery of prefabricated components, especially in the city's congested urban areas (Oladokun & Gbadegesin, 2017). Furthermore, weak government policy frameworks, absence of standardized regulations, and limited incentives have slowed private sector investment and the broader adoption of industrialized building systems (Babatunde & Opawole, 2018).

Methods of the study

This study provide a comparative evaluation industrialized building systems and conventional construction methods in Port Harcourt, Nigeria. A descriptive research approach was adopted, utilizing a structured questionnaire administered based on five points likert scales to professionals across both public and private construction sectors in Port Harcourt including engineers, architects, contractors, quantity surveyors, project managers and builders. The study employed both primary and secondary data sources. Out of seventy (70) distributed questionnaires, sixty (60) was duly completed and deemed valid for analysis. We analyzed the data using mean and standard deviation with the aid of a statistical tools (SPSS version 25.0) According to the study findings, industrialized building systems projects utilized standardized, prefabricated components such as beam, panels and slabs manufactured under controlled factory conditions, in contrast to labor intensive, on site processes characteristic conventional construction. The result further review that industrialized building systems achieves superior time cost performance, reducing project duration approximately 40–50% compared to conventional methods. Nevertheless, the wide spread adoption of industrialized building systems in port Harcourt is hindered by factors such as insufficient technical expertise, high initial set up costs, weak government policy support, poor infrastructure for transporting prefabricated components and cultural resistance for to modern construction system . The study concludes by recommending that construction stakeholders should adopt a hybrid strategy that merges the efficiency of prefabrication with the adaptability of conventional methods, while both government agencies and private developers should undertake a comprehensive cost benefit analyses prior to selecting an appropriate construction approach.

RESULTS AND DISCUSSIONS OF FINDINGS

Table 1: Questionnaire distribution and responses

Respondents	Distribution	Responses	(%)Responses
Quantity Surveyors	14	12	86
Architects	12	11	92
Engineers	12	10	83
Project Managers	10	8	80
Builders	12	10	83
Contractors	10	9	90
Total	70	60	86

Source: Field Data 2025.

Data Analyses

Table 2: Summary of mean and standard deviation statistics on the components and processes involved in both Industrialized Building Systems and conventional construction methods.

S/N	Items	SA	A	N	D	SD	Mean	Std.	Decision
1	I am familiar with Industrialized Building System (IBS) techniques such as prefabrication, modular, and panelized systems.	28	27	5	0	0	4.38	0.64	Agreed
2	Conventional construction methods are more commonly used than IBS in Port Harcourt.	16	28	12	3	1	3.92	0.91	Agreed
3	IBS provides adequate design flexibility.	19	29	10	2	0	4.08	0.79	Agreed
4	IBS allows for faster construction speed.	23	26	7	2	2	4.10	0.97	Agreed
5	IBS ensures better quality consistency.	29	22	7	2	0	4.30	0.81	Agreed
6	IBS materials are readily available in Port Harcourt.	19	31	9	1	0	4.13	0.72	Agreed

7	Conventional construction provides adequate design flexibility.	21	27	7	5	0	4.07	0.90	Agreed
8	Conventional construction allows for faster construction speed.	20	29	6	2	3	4.02	1.02	Agreed
9	Conventional construction ensures better quality consistency.	16	26	15	1	2	3.88	0.94	Agreed
10	Conventional construction materials are readily available in Port Harcourt.	21	28	8	3	0	4.12	0.83	Agreed
	Grand mean						**4.07**	**0.31**	**Agreed**

Source: Researcher's Fieldwork (2025).

The results from Table 2 show the summary of mean and standard deviation statistics on the components and processes involved in both Industrialized Building Systems and conventional construction methods. It shows that the grand mean of the respondents over the components and processes was 4.07, SD=0.31. Specifically, the respondents agreed that familiarity with Industrialized Building System (IBS) techniques such as prefabrication, modular, and panelized systems was a key component with a mean rating of 4.38, SD=0.64. This was followed by IBS ensuring better quality consistency with a mean rating of 4.30, SD=0.81. IBS materials being readily available in Port Harcourt had a mean rating of 4.13, SD=0.72. Conventional construction materials being readily available in Port Harcourt had a mean rating of 4.12, SD=0.83. IBS allowing for faster construction speed had a mean rating of 4.10, SD=0.97. IBS providing adequate design flexibility had a mean rating of 4.08, SD=0.79. Conventional construction providing adequate design flexibility had a mean rating of 4.07, SD=0.90. Conventional construction allowing for faster construction speed had a mean rating of 4.02, SD=1.02. Conventional construction being more commonly used than IBS in Port Harcourt had a mean rating of 3.92, SD=0.91. Lastly, conventional construction ensuring better quality consistency had a mean rating of 3.88, SD=0.94.

Table 3: Summary of mean and standard deviation statistics on the direct and indirect costs associated with both methods.

S/N	Items	SA	A	N	D	SD	Mean	Std.	Decision
11	IBS has a higher initial cost than conventional methods.	14	38	6	2	0	4.07	0.69	Agreed
12	IBS incurs higher labour costs than conventional methods.	19	35	4	1	1	4.17	0.76	Agreed
13	IBS incurs higher indirect/overhead costs (e.g., site management, logistics) than conventional methods.	20	31	7	2	0	4.15	0.76	Agreed
14	IBS significantly affects material costs.	25	29	6	0	0	4.32	0.65	Agreed
15	IBS significantly affects labour costs.	22	27	10	1	0	4.17	0.76	Agreed
16	IBS significantly affects plant and equipment costs.	21	33	4	0	2	4.18	0.83	Agreed

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17	Conventional construction significantly affects material costs.	18	32	9	0	1	4.10	0.77	Agreed
18	Conventional construction significantly affects labour costs.	25	24	5	4	2	4.10	1.04	Agreed
19	Conventional construction significantly affects plant and equipment costs.	21	27	5	4	3	3.98	1.08	Agreed
	Grand mean						**4.14**	**0.28**	**Agreed**

Source: Researcher's Fieldwork (2025).

The results from Table 3 show the summary of mean and standard deviation statistics on the direct and indirect costs associated with both methods. It shows that the grand mean of the respondents over the direct and indirect costs was 4.14, SD=0.28. Specifically, the respondents agreed that IBS significantly affecting material costs was a key factor with a mean rating of 4.32, SD=0.65. This was followed by IBS significantly affecting plant and equipment costs with a mean rating of 4.18, SD=0.83. IBS incurring higher labour costs and significantly affecting labour costs each had a mean rating of 4.17, SD=0.76. IBS incurring higher indirect/overhead costs (e.g., site management, logistics) had a mean rating of 4.15, SD=0.76. Conventional construction significantly affecting material costs and labour costs each had a mean rating of 4.10, SD=0.77 and SD=1.04, respectively. IBS having a higher initial cost than conventional methods had a mean rating of 4.07, SD=0.69. Lastly, conventional construction significantly affecting plant and equipment costs had a mean rating of 3.98, SD=1.08.

Table 4: Summary of mean and standard deviation statistics on the time-cost efficiency of IBS and conventional construction.

S/N	Items	SA	A	N	D	SD	Mean	Std.	Decision
20	The initial cost of Industrialized Building Systems (IBS) is higher compared to conventional construction methods.	24	25	8	2	1	4.15	0.90	Agreed
21	The labor cost associated with Industrialized Building Systems (IBS) is higher than that of conventional methods.	22	33	5	0	0	4.28	0.61	Agreed
22	The indirect/overhead costs (e.g., site management, logistics) of Industrialized Building Systems (IBS) are higher than those of conventional construction methods.	20	29	6	4	1	4.05	0.93	Agreed
23	The use of Industrialized Building Systems (IBS) significantly increases material costs compared to conventional construction methods.	23	31	4	1	1	4.23	0.79	Agreed
24	The use of Industrialized Building Systems (IBS) significantly increases labor costs compared to conventional construction methods.	17	28	10	2	3	3.90	1.02	Agreed
25	The use of Industrialized Building Systems (IBS) significantly increases plant and	23	24	7	6	0	4.07	0.95	Agreed

	equipment costs compared to conventional construction methods.								
	Grand mean						**4.10**	**0.29**	**Agreed**

Source: Researcher's Fieldwork (2025).

The results from Table 4 show the summary of mean and standard deviation statistics on the time-cost efficiency of IBS and conventional construction. It shows that the grand mean of the respondents over the time-cost efficiency was 4.10, SD=0.29. Specifically, the respondents agreed that the labor cost associated with Industrialized Building Systems (IBS) being higher than that of conventional methods was a key factor with a mean rating of 4.28, SD=0.61. This was followed by the use of Industrialized Building Systems (IBS) significantly increasing material costs compared to conventional construction methods with a mean rating of 4.23, SD=0.79. The initial cost of Industrialized Building Systems (IBS) being higher compared to conventional construction methods had a mean rating of 4.15, SD=0.90. The use of Industrialized Building Systems (IBS) significantly increasing plant and equipment costs compared to conventional construction methods had a mean rating of 4.07, SD=0.95. The indirect/overhead costs (e.g., site management, logistics) of Industrialized Building Systems (IBS) being higher than those of conventional construction methods had a mean rating of 4.05, SD=0.93. Lastly, the use of Industrialized Building Systems (IBS) significantly increasing labor costs compared to conventional construction methods had a mean rating of 3.90, SD=1.02.

Table 5: Summary of mean and standard deviation statistics on the challenges hindering the Implementation of Industrialized Building Systems in Port Harcourt.

S/N	Items	SA	A	N	D	SD	Mean	Std.	Decision
26	The high initial cost hinders IBS implementation in Port Harcourt.	19	32	8	1	0	4.15	0.71	Agreed
27	Lack of local expertise hinders IBS implementation in Port Harcourt.	24	25	9	2	0	4.18	0.81	Agreed
28	Resistance to change hinders IBS implementation in Port Harcourt.	17	30	9	3	1	3.98	0.89	Agreed
29	Limited prefabrication facilities hinders IBS implementation in Port Harcourt.	22	28	7	3	0	4.15	0.82	Agreed
30	Transportation and logistics challenges hinders IBS implementation in Port Harcourt.	29	23	5	2	1	4.28	0.88	Agreed
31	Lack of purchasing of specialized machinery hinders IBS implementation in Port Harcourt.	28	25	5	2	0	4.32	0.77	Agreed
32	Weak government policy frameworks hinders IBS implementation in Port Harcourt.	22	30	7	1	0	4.22	0.72	Agreed
33	Absence of standardized regulations hinders IBS implementation in Port Harcourt.	19	28	9	4	0	4.03	0.86	Agreed
34	Inadequate technology infrastructure hinders IBS implementation in Port Harcourt.	19	30	7	2	2	4.03	0.94	Agreed
	Grand mean						**4.15**	**0.23**	**Agreed**

Source: Researcher's Fieldwork (2025).

The results from Table 5 show the summary of mean and standard deviation statistics on the challenges and benefits of implementing IBS in Port Harcourt. It shows that the grand mean of the respondents over the challenges and benefits was 4.15, SD=0.23. Specifically, the respondents agreed that government incentives encouraging IBS adoption in Port Harcourt was a key benefit with a mean rating of 4.32, SD=0.77. This was followed by transportation and logistics challenges hindering IBS adoption in Port Harcourt with a mean rating of 4.28, SD=0.88. Training and awareness programs encouraging IBS adoption in Port Harcourt had a mean rating of 4.22, SD=0.72. The high initial cost hindering IBS adoption in Port Harcourt and limited prefabrication facilities hindering IBS adoption in Port Harcourt each had a mean rating of 4.15, SD=0.71 and SD=0.82, respectively. Lack of local expertise hindering IBS adoption in Port Harcourt had a mean rating of 4.18, SD=0.81. Local IBS manufacturing plants encouraging IBS adoption in Port Harcourt and partnerships with foreign firms encouraging IBS adoption in Port Harcourt each had a mean rating of 4.03, SD=0.86 and SD=0.94, respectively. Lastly, resistance to change hindering IBS adoption in Port Harcourt had a mean rating of 3.98, SD=0.89.

DISCUSSION OF FINDINGS

The findings from Table 2 show that respondents strongly agree on the components and processes involved in both Industrialized Building Systems (IBS) and conventional construction methods, with an overall mean of 4.07 and a standard deviation of 0.31, indicating a high level of consensus. Familiarity with IBS techniques, such as prefabrication, modular, and panelized systems, is rated highest, with a mean of 4.38 and a standard deviation of 0.64, suggesting that professionals are well-acquainted with these methods. Research supports this, noting that familiarity with IBS techniques is growing due to their increasing use in modern construction for efficiency and standardisation (Ogunmakinde & Eze, 2023). Similarly, IBS ensuring better quality consistency, with a mean of 4.30 and a standard deviation of 0.81, is highly valued, indicating that these systems are seen as reliable for maintaining high standards. Studies confirm that IBS methods, like prefabrication, often result in improved quality control compared to traditional methods (Akinradewo & Ojo, 2022). Other aspects, such as material availability for both IBS (mean of 4.13) and conventional construction (mean of 4.12), and faster construction speed with IBS (mean of 4.10), also rank highly, while conventional construction scores lower for quality consistency (mean of 3.88). These results suggest that IBS is increasingly recognized for its quality and efficiency, but conventional methods remain relevant due to their flexibility and familiarity. The findings from Table 3 show that respondents strongly agree on the direct and indirect costs associated with Industrialized Building Systems (IBS) and conventional construction methods, with an overall mean of 4.14 and a standard deviation of 0.28, indicating a high level of consensus. The most significant factor is that IBS significantly affects material costs, with a mean rating of 4.32 and a standard deviation of 0.65, suggesting that material expenses are a major consideration in IBS projects. Research supports this, noting that IBS often involves higher material costs due to the use of prefabricated components, which require precise specifications (Ogunmakinde & Akanbi, 2024). Similarly, IBS significantly affecting plant and equipment costs, with a mean of 4.18 and a standard deviation of 0.83, highlights the substantial investment in specialized equipment for IBS. Studies confirm that IBS methods typically require advanced machinery, increasing equipment-related costs compared to conventional methods (Eze & Ojo, 2021). Other factors, such as higher labour costs for IBS (mean of 4.17) and material costs for conventional construction (mean of 4.10), also rank highly, while conventional construction's impact on plant and equipment costs scores lower (mean of 3.98). These results suggest that IBS tends to have higher material and equipment costs, underscoring the need for careful cost planning when choosing between IBS and conventional methods. The findings from Table 4 show that respondents strongly agree on the factors affecting the time-cost efficiency of Industrialized Building Systems (IBS) compared to conventional construction methods, with an overall mean of 4.10 and a standard deviation of 0.29, indicating a high level of consensus. The most significant factor is the higher labour costs associated with IBS compared to conventional methods, with a mean rating of 4.28 and a standard deviation of 0.61, suggesting that labour expenses are a major concern for IBS projects. Research supports this, noting that IBS often requires skilled labour for prefabrication and assembly, which increases labour costs compared to traditional construction (Akinradewo & Eze, 2023). Similarly, the use of IBS significantly increasing material costs compared to conventional methods, with a mean of 4.23 and a standard deviation of 0.79, highlights the higher expense of specialised materials in IBS. Studies confirm that IBS relies on prefabricated components, which tend to be more costly than materials used in conventional construction (Ojo & Ugochukwu, 2022). Other factors, such as higher initial costs (mean of 4.15) and increased plant and equipment costs (mean of 4.07) for IBS, also rank highly, while indirect costs score slightly lower (mean of 4.05). These results suggest that while IBS may offer efficiency benefits, its higher labour and material costs require careful consideration in project planning. The findings from Table 5 show that respondents strongly agree on the challenges of implementing Industrialized Building Systems (IBS), with an overall mean of 4.15 and a standard deviation of 0.23, indicating a high level of consensus. Lack of purchasing of specialized machinery hinders IBS implementation in Port Harcourt are rated as the top challenges, with a mean of 4.32 and a standard deviation of 0.77, suggesting that lack of purchasing of specialized machinery significantly slow the use of IBS. Research supports this, noting that lack of early purchase of specialized machinery hinders IBS implementation in construction projects (Eze & Ogunmakinde, 2023). However, transportation and logistics challenges are identified as a major hindrance, with a mean of 4.28 and a standard deviation of 0.88, indicating that difficulties in moving prefabricated components limit IBS implementation. Studies confirm that logistical issues, such as poor transportation infrastructure, often impede the effective use of IBS in construction (Akinradewo & Ugochukwu, 2022). Other factors, such as training programs (mean of 4.22) and high initial costs (mean of 4.15), also rank highly, while resistance to change scores lower (mean of 3.98). These results suggest that while government support and training boost IBS adoption, logistical challenges and costs remain significant barriers, highlighting the need for improved infrastructure and cost management strategies.

CONCLUSION

The comparative analysis of industrialized building systems and conventional construction methods in Port Harcourt, Nigeria, highlights notable distinctions in their workflows, cost dynamics, time management, and overall project performance. Both approaches play essential roles in the Nigerian construction landscape. However, their effectiveness is largely determined by the specific projects scope, objectives, and economic context. The findings suggest that industrialized building systems presents a more sustainable, efficient, and cost effective option over the long term. Despite its advantages, the widespread implementation of industrialized building in Port Harcourt and across Nigeria faces key obstacles such as high initial investment requirements, limiting technical expertise, insufficient standardization, and weak policy support. Promoting investments in prefabrication facilities, expanding training programs for technical and management professionals, and providing policy incentives for developers could significantly boost the shift toward industrialized construction. Ultimately, while conventional methods remain suitable for smaller scale projects prioritizing flexibility and affordability, the future growth of Nigeria’s construction sector particularly in rapidly urbanizing regions like Port Harcourt rest on adopting the sustainable, time and cost efficient benefits of industrialized building system. Incorporating industrialized construction into national housing and infrastructure strategies will enable Nigeria to enhance construction quality, shorten project timeline, and meet the growing demand for resilient and affordable urban hosing

RECOMMENDATIONS

1. Construction stakeholders should adopt a hybrid strategy that merges the efficiency of prefabrication with the adaptability of conventional methods.

2. Both government agencies and private developers should undertake a comprehensive cost benefit analyses prior to selecting an appropriate construction approach.

3. Construction companies should adopt digital tools such as building information modeling and project management software to enhance both industrialized building systems and conventional construction methods.

4. There is a need to strengthen capacity building initiatives aimed at training artisans, engineers and project managers in the technical and managerial competencies required for effective industrialized building system production and assembly.

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