INNOVATIVE APPROACHES TO SUPPLY CHAIN COORDINATION IN PREFABRICATED HOUSING CONSTRUCTION

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Abstract: *Urbanization has resulted in a dramatic increase in the urban population. This has led to a lack of houses for people, especially those on low incomes. This shortage cannot be solved by traditional building practices, because the latter as acceptable for the past, involve slow construction time, high expenses, waste and require a significant amount of work and resources. Therefore, an advance from traditional labour based systems to prefabricated construction is widely regarded as a major opportunity that will bring about a dramatic improvement in the productivity and efficiency of housing supply. Part of the solution as long as it is well-planned, lies in prefabricated housing construction which is also a money-saving solution. Although prefabrication is considered to have advantages, its use is limited. Some authors from different countries have described a number of barriers to its application. Some include high cost to set up prefabrication facilities, unwilling attitude of local construction parties, poor infrastructure, and lack of skills. Previous studies also reveal that supply chain is a primary obstacle for the development of prefabricated housing construction, but it is rarely analyzed so far. Although some studies focused on obstacles to prefabrication in some foreign countries, no research has given detailed attention to supply chain management problems in Nigeria. Although some research work has been done on the barriers, there is little in supply chain management literature in Nigeria. The development of easy-to-use, supply chain management will be essential to realize the full potential of prefabricated housing construction in the nation. This has stimulated this study of supply chain management in prefabricated building construction in Nigeria. The key research questions the study is trying to contribute to address is "What are the ways in which Supply Chain Management for prefabricated construction can be improved within Nigeria?"*

Keywords: **Building Efficiency; Innovative Construction; Prefabricated Housing; Supply Chain Coordination; Nigeria**

1. INTRODUCTION

Adequate housing provision is a serious issue in most nations of the world. This problem is more prevalent in the less developed countries, where there are slums or lack of housing [1]. This postures serious challenges among urban city dwellers and low-income earners which have been heightened by high population growth rate, shortage of requisite skills, slow pace construction and infrastructure/logistics development; as well in quality housing stock [2]. Urbanization, the movement of rural residents to cities, has led to environmental problems such as housing shortages in some big cities. It's resulted in a lopsided economy. The same can be said in developing countries such as Nigeria. Despite a number of measures adopted by the Nigerian government to address housing problems, over 22 million housing units are still said to be needed in Nigeria [2,3]. To reduce this sharply, approximately one million sheltered houses must be constructed annually [4,5]. This resolve has prompted researchers and practitioners in Nigeria's building industry to clamour for a shift from the traditional ways or methods of constructing to more contemporary methods proved to be faster, leaner and greener [6,7].

The use of prefabrication method has been widely considered an environmentally friendly alternative to traditional construction for many years as it holds the potential in enhancing building quality, shortening construction time, increasing the efficiency in resource usage, minimizing waste generation from construction activities, enhancing health and safety performance factors while utilizing economies of scale all that have significant cost benefits [8]. Using prefabricated construction is one way to bring costs down. As in the case of Vanke, the largest residential estate developer in Mainland China, mentioned above, they estimated that a prefabricated housing project reduced energy use by 70%, raw materials by 50%, construction time by 40%, and on-site labor at least 50% [9]. In

this respect, standardized building represents an opportunity to quickly produce affordable housing. The average level of prefabrication in the building sector is about 20-25 per cent within the EU with the Nordic countries achieving rates up to 40-50 per cent [9]. Notwithstanding the above-sung benefits and success stories, the use of prefabricated construction in developing countries such as Nigeria is still very low [10,11].

A few barriers of the development of prefabricated construction besides cost barrier were identified, through process and knowledge barriers. Existing studies [9,12,13] have highlighted that the supply chain system is one of the major barriers for constructing prefabricated buildings. According to Lawson et al., [14] and Minunno et al. [15], offsite technology is strategically important to the timely delivery and drive up productivity of the construction industry. Once the supply chain for prefabrication components is not well managed, the performance is often influenced. It is this inability to share real-time information between the off-site manufacturers and the on-site constructor that results in poor coordination, redundancies and delay on a project.

This research is designed to address the challenge of improving supply chain coordination of prefabricated home building in Nigeria. The study aims to investigate new approaches to supply chain coordination of Nigeria prefab house. The objectives of the study are to (i)Examine supply chain coordination policies on Nigeria's prefab house building industry, and possible global experience. (ii) Investigate constraints and facilitators of coordination across stakeholders in Nigeria, which include fabricators, logistics operators, contractors, and on-site assemblers. (iii) Create alternative coordination mechanisms (technological, contractual and relational) that could enhance supply chain performance in the Nigerian prefabricated house industry. From this, we deduce that there is potential for increased level of coordination among component manufacturers, logistics provider and site contractors which will significantly enhance the efficiency (delivery time, cost and quality) of prefabricated housing in Nigeria.

This study is essential because it tackles a major gap in Nigeria's housing delivery which is one that cannot rely exclusively on traditional construction methods given the enormity of the housing shortage. This study advances both theory and practice by focussing on supply chain coordination in the prefabricated home arena. It enhances academic understanding of how construction supply chains, particularly off-site prefabrication, can be efficiently organised and managed in developing countries. It also offers useful insights for industry parties (manufacturers, contractors, and government agencies) looking to accelerate housing delivery. In particular, the study helps Nigerian policymakers and practitioners implement more efficient housing solutions by identifying factors that reduce lead times, cost overruns, and quality failures in prefabricated housing projects..

2. LITERATURE REVIEW

Prefabricated housing, also known as modular or off-site construction, involves manufacturing building components or full modules in a controlled factory setting and shipping them to the job site for final assembly. According to Lee et al., [16] when compared to traditional on-site methods, prefabrication shortens building time, improves quality control, lowers material waste, and allows for economies of scale. Lee's [16] systematic analysis of literature from 1970 to 2023 found that prefabricated residential building is gaining global traction as a potential solution to housing shortages due to mass production, quality assurance, and rapidity.

Prefabrication is still relatively uncommon in Nigeria. Adindu et al., [10] discovered a poor level of understanding (mean = 2.32) and adoption (mean = 2.13) of prefabricated building among professionals in North Central Nigeria. Similarly, Alagbe and Aina-Badejo [17] stated that, while prefabrication has the potential to produce fast and smart housing, its deployment in Abuja is hampered by costs, talent shortages, and cultural resistance. With a national housing shortfall of over 22 million units and an annual demand for approximately one million more houses [3], prefabrication is a strategic method for attaining large-scale, efficient housing delivery in Nigeria.

Supply chain coordination refers to the interactions, flows, and control mechanisms that coordinate project stakeholders, including manufacturers and suppliers, logistics providers, and on-site contractors [18]. Effective coordination ensures that prefabricated elements arrive at the appropriate time, sequence, and quality, avoiding costly delays and waste [19]. Chen et al. [18] emphasised that, despite the maturity of general supply chain management theory, prefabricated house applications continue to lag, notably in terms of supplier-contractor collaboration. Zhang et al., [19] found that shipment lead-time hedging techniques increase coordination between contractors and logistics providers by minimising uncertainty in component deliveries. According to Okafor et al., [20] fragmented communication, weak infrastructure, and regulatory inconsistencies continue to impair supply chain performance in Nigeria's construction industry. Thus, coordination remains an important yet underexplored issue in Nigeria's prefabricated house market.

Recent advances in prefabricated construction have combined technological, contractual, and relational factors to increase cooperation. Building Information Modelling (BIM), Internet of Things (IoT) sensors, and cloud-based logistics tracking are examples of digital solutions that allow supply chain participants to communicate information in real time. Manufacturing and assembly schedules can be synchronised via contractual mechanisms such as just-in-time (JIT) delivery agreements and supplier relationship frameworks [21].

Albaadani et al., [22] found that combining modular design with supply chain digitisation improves flexibility and quality while shortening building timelines. Andrijasevic [21] have proved that factory-controlled production and environmentally friendly materials improve overall resource efficiency and structural stability. In Nigeria, understanding of such ideas is low, but their implementation might significantly improve performance and minimise waste. Current study does not include much empirical testing of these mechanisms in local prefabricated home projects. As posited by Adindu et al., [10], Nigeria's prefabricated housing supply chain faces several obstacles, including limited adoption of prefabricated technology, poor logistics infrastructure, inconsistent laws, and poor stakeholder communication [11]. High initial investment costs for plant setup, financial constraints, and a shortage of specialised skills all hinder growth [20]. However, opportunities exist. The enormity of housing demand provides scaling opportunities. Prefabrication supports Nigeria's sustainable housing plans by providing faster delivery, less waste, and better-quality control. Technological and relational coordination mechanisms, such as digital logistics monitoring and collaborative procurement frameworks, provide practical ways to address inefficiencies in Nigeria's building supply chain.

Although global research on prefabricated building and supply chain coordination is expanding, few empirical studies have focused on novel coordination mechanisms in Nigeria's housing sector. Specifically, there is no information on how technological, contractual, and relational coordination approaches combine to influence project outcomes. This study thus employs a conceptual framework that connects coordination mechanisms (technological, contractual, and relational) to intermediate outcomes (information integration, logistics synchronisation, trust, and communication efficiency) and final project outcomes (cost and time savings, improved quality, and sustainable housing delivery). This paradigm serves as the foundation for an empirical inquiry into novel ways to supply chain coordination in Nigeria's prefabricated house industry.

3. RESEARCH METHODOLOGY

3.1 Research Design and Rationale

This study uses a qualitative research design to investigate novel approaches to supply chain coordination in prefabricated home construction in Nigeria. The qualitative technique was chosen because the study aims to gather in-depth insights into stakeholders' perspectives, practices, and lived experiences in prefabricated house delivery. According to Rahman [23], qualitative approaches are appropriate for investigating complex social and organisational phenomena requiring contextual understanding. The literature analysis identified major contextual, institutional, and coordination-related constraints in Nigeria's construction industry, which cannot be fully reflected by numerical surveys or standardised instruments [24,25]. The research found that most studies on supply chain

coordination and prefabrication in developing countries lacked a thorough knowledge of stakeholder relationships, local supply chain restrictions, and institutional issues [26]. As a result, this study indicated that semi-structured interviews with important industry actors would be the most effective for gathering thorough, experience-based data and identifying the socio-technical variables driving coordination. The decision to use just a qualitative method is explained by the study's exploratory nature and the scarcity of credible quantitative datasets on prefabrication projects in Nigeria. Furthermore, qualitative interviews promote flexibility and open discussion, allowing participants to communicate their experiences and thoughts outside the limits of pre-coded survey questions [27,28].

3.2 Study Area and Population

The study is centred on Lagos State, Nigeria, a significant construction hub and one of the most active places for prefabricated and modular construction projects. Lagos' rapidly urbanising climate, infrastructure constraints, and expanding use of industrialised building methods make it an excellent case study for investigating coordinating mechanisms in prefabricated housing supply chains. The target population consists of a varied range of construction industry stakeholders and experts who have a direct or indirect impact on the prefabricated housing value chain. These roles include project managers, site supervisors, prefabrication factory operations and technical managers, resident architects, civil/structural engineers, material suppliers, logistics/haulage managers, and housing agency policy officers. Both professional and non-professional actors were considered in order to gain a diverse viewpoint on the coordination and implementation of prefabricated home projects.

3.3 Sampling Technique and Sample Size

A purposive sample strategy was used to select participants who had extensive knowledge and practical expertise in prefabricated construction and supply chain coordination. This non-probabilistic technique was appropriate given Nigeria's small number of prefabrication firms and professionals [29]. The study initially planned to conduct 40 interviews with 10 participants from each of four stakeholder groups: prefabrication firms, construction companies, logistics providers, and material suppliers. However, data saturation was reached after 28 interviews, with no new themes or insights emerging [30]. This final sample size of 28 participants is consistent with Creswell's [28] and Bradley et al.'s [31] recommendations of 10-30 participants for qualitative interview-based research. Participant inclusion conditions are (i) Minimum of five years of expertise in construction or supply chain management. (ii) Active participation in prefabricated or modular housing projects. (iii) Representation of one of four stakeholder categories (prefabrication, logistics, materials supply, or construction).

3.4 Data Collection Procedure and Instruments

Semi-structured interviews with participants were conducted in person to collect primary data. Each session lasted from 30 to 45 minutes. The interview guide was created using themes highlighted in the literature, such as coordination mechanisms, information exchange, technological integration, and stakeholder participation [32,33]. The questions were open-ended to encourage descriptive and reflective responses, and the wording was simple and clear to enable accessibility. The interview guide has two primary sections: (i) Demographic information, such as professional background, years of experience, and company type. (ii) Thematic questions on coordinating methods, impediments, creative mechanisms, and perceptions of prefabricated houses in Nigeria. All interviews were audio-recorded with participant permission and transcribed verbatim. Prior to the primary data collection, two professionals participated in pilot interviews to fine-tune question phrasing and check field logistics.

3.5 Data Analysis

The data were analysed using thematic analysis in accordance with Braun and Clarke's [34] six-step methodology. This method was chosen for its adaptability and usefulness in detecting, structuring, and analysing patterns in qualitative datasets. The analysis procedure included (i) Transcription: Verbatim transcription of recorded interviews. (ii) Initial Familiarisation: Read and re-read transcripts to comprehend the data context. (iii) Open Coding: Assign descriptive codes to meaningful sentences using NVivo 12 software. (iv) Theme Development: Organising related codes into categories including coordination hurdles, creative strategies, and stakeholder responsibilities. (v) Reviewing Themes: Identifying convergence and divergence among stakeholder groups. (vi) Interpretation: Linking emerging themes to theoretical frameworks and literature to gain a

conceptual knowledge of coordination dynamics. This analytical method enabled the researcher to develop a solid grasp of how new coordinating mechanisms affect prefabricated house deliveries in Nigeria.

3.6 Ethical Considerations

The university's research ethics committee gave its clearance. All participants were made aware of the study's goal and ensured of their privacy and confidentiality. Before each interview, we got written informed consent. Audio recordings and transcripts were securely saved in password-protected folders, and will be retained for five years before being destroyed. In summary, the qualitative methodology based on semi-structured interviews and thematic analysis was driven by literature findings emphasising the importance of contextual, experience-based insights. This approach allows the study to capture the multidimensional, relational, and institutional features of supply chain coordination in Nigeria's prefabricated housing sector, laying a solid foundation for the development of the suggested conceptual framework for creative coordination practices.

4. RESULTS AND DISCUSSION

This study used 28 semi-structured interviews with key industry stakeholders, including materials suppliers, prefabrication firms, logistics operators, and construction professionals, to evaluate novel approaches to supply chain coordination in Nigerian prefabricated housing building. The data were thematically analysed with NVivo 12, revealing significant coordination issues and potential breakthroughs. The data was interpreted using a conceptual framework (Figure 1) taken from past studies [19,35,36], which emphasised four interdependent dimensions determining supply chain performance: (i) Integrating information and improving digital connectivity. (ii) Collaboration in procurement and stakeholder synergy. (iii) Efficient logistics and timely delivery. (iv) Provide institutional and policy support. Together, these characteristics provide a comprehensive perspective on prefabrication's ability to address inefficiencies in Nigeria's building supply chain.

4.1 Discussion based on conceptual framework developed from previous literature

Based on the conceptual framework built from prior research [19, 35,36] this study contends that the successful coordination of supply chains in prefabricated housing building in Nigeria is determined by four primary dimensions: (i) Information integration and digital connectivity; (ii) collaborative procurement and stakeholder synergy; (iii) logistics and just-in-time delivery efficiency; and (iv) institutional and policy support for prefabrication. To illustrate this diagrammatically, a model (Figure 1) is proposed in which information integration and stakeholder collaboration act as mediating variables to improve overall supply chain performance, resulting in faster project delivery, lower costs, and better material utilisation.

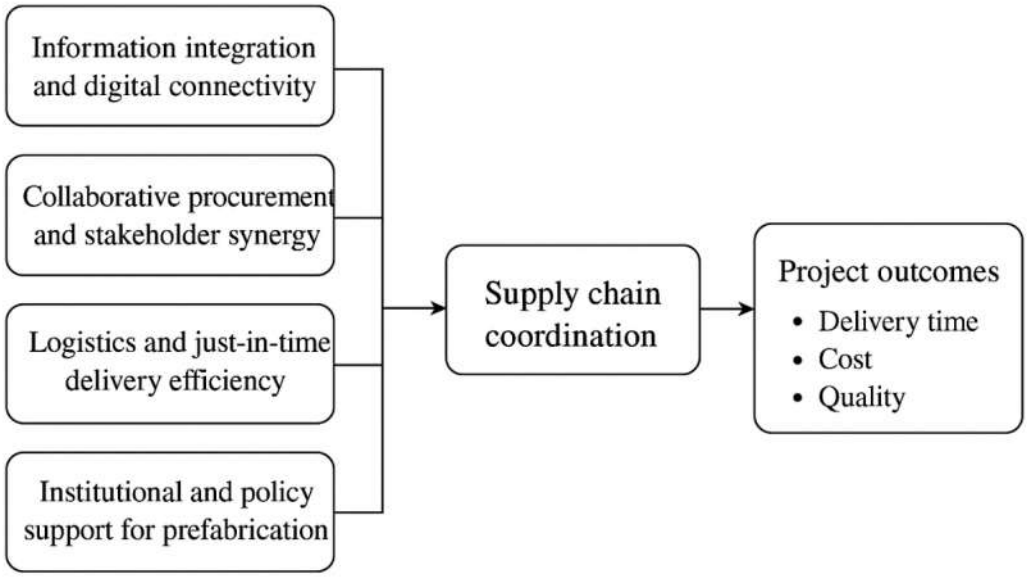

Figure 1: Conceptual framework

Furthermore, Table 1 shows and summarises the expected correlations generated from preliminary conceptual analysis and literature review insights.

Table 1: Expected relationships derived from preliminary conceptual analysis and literature review insights.

Factor	Expected Impact on Supply Chain Coordination	Supporting Literature
Information integration (BIM, IoT, and digital tracking)	Improves openness, minimises confusion, allows for real-time updates between companies and construction sites.	[6,37,38]
Collaborative procurement models	Increases trust and shared objectives among project actors, decreasing fragmentation.	[19]
Logistics optimisation and local industrial centres.	Reduces shipping delays, improves component quality, and is consistent with environmental goals.	[15,36]
Government incentives and regulatory structures.	Promotes investment in prefabrication technologies and innovation uptake.	[39,40]

4.1.1 Information Integration and Digitalization in Prefabricated Supply Chains

The findings indicate that information integration via digital tools such as Building Information Modelling (BIM), the Internet of Things (IoT), and blockchain greatly enhances coordination efficiency throughout the prefabrication process. Cao et al. [6] and Wu et al., [41] discovered comparable impacts in China and Singapore, where digital communication systems improved synchronisation across design, production, and assembly teams. However, in Nigeria, digital infrastructure and skill capability remain significant hurdles [38]2020). Local construction companies frequently rely on handwritten documentation and fragmented data transmission, resulting in schedule delays and misalignment between suppliers and contractors. These findings are consistent with Yitmen et al., [36] 2024 emphasis on digital literacy and integration as conditions for reaching Construction 5.0 readiness in underdeveloped countries.

4.1.2 Collaborative Procurement and Stakeholder Synergy

The findings emphasise the necessity of relational contracting, framework agreements, and cooperative risk-sharing mechanisms for improving coordination throughout the prefabrication supply chain. This is consistent with the arguments of Zhang et al.,[19] and Liu et al. [42] who found that collaborative contracting enhances trust and mutual problem-solving in off-site construction. Traditional procurement practices, which are characterised by antagonistic interactions and hierarchical communication, continue to be dominant in Nigeria. To be consistent with worldwide best practices, partnering and integrated project delivery (IPD) approaches must be tailored to local contexts while balancing cultural, institutional, and regulatory realities.

4.1.3 Logistics and Just-in-Time (JIT) Delivery Systems

According to literature and field expectations, logistics and JIT principles are critical to achieving prefabrication efficiency. Delays in component transportation, inadequate road infrastructure, and customs bottlenecks are major difficulties in Nigeria's supply chain [40]. In contrast, Minunno et al. [15] and Steinhardt et al., [39] demonstrated how optimised logistics scheduling and decentralised production hubs reduced material waste and idle time in Europe and Australia. Adapting similar tactics, such as regional prefabrication clusters or smart logistics planning with GIS and IoT, might considerably increase Nigeria's capacity for prefabricated house supply.

4.1.4 Institutional and Policy Support

Institutional support and clear regulatory frameworks are critical for prefabrication growth. Masood et al., [35] and Lawson et al., [14]. found that government incentives, subsidies, and certification procedures are critical for maintaining prefabrication supply chains. In Nigeria, uneven policies and inconsistent enforcement have hindered adoption rates. Nonetheless, new initiatives, such as the 2022 National Building Code update and the Nigerian Sustainable Housing Framework, provide opportunity to include prefabrication standards and digital coordination principles.

From above discussion of findings, it could be summarized and argued that (i) Supply chain coordination in prefabrication relies heavily on effective information integration. (ii) Collaborative procurement and trust-based partnerships should replace traditional competitive contracting approaches. (iii) Optimising logistics and localising manufacturing can reduce inefficiencies in time and cost. (iv) Adopting large-scale prefabrication in Nigeria requires strong government policy coherence and capacity-building. These findings highlight the need for a holistic paradigm aligned with building 5.0 principles to drive innovation in Nigerian prefabricated home building.

4.2 Discussion based on the analysis of interviews conducted with stakeholders

4.2.1 Policy Gaps and Lack of Government Incentives

The majority of respondents (68%) indicated insufficient policy support for prefabrication. Respondents observed a lack of government incentives or tax breaks for off-site producers. One participant stated that *"the government has not been forthcoming with policies that will help alleviate the citizens' housing problems"* (RLS6Q1). This conclusion supports Osunsanmi et al. [43], Tam et al. [44] and Jin et al., [45] who highlighted policy inertia as a major barrier to prefabrication adoption in underdeveloped nations. In contrast, the United Kingdom, Japan, and Sweden have used fiscal incentives and public-sector procurement rules to encourage prefabricated housing [46, 19]. The Nigerian government's lack of such tools deters investment and delays innovation spread. Institutional support and consistent policy frameworks are required to mature off-site ecosystems [35, 39]. Their absence increases production costs and discourages scaling.

4.2.2 Limited Awareness and Stakeholder Resistance

Two-thirds of respondents cited low public knowledge and resistance from traditional builders. Many Nigerians *"still prefer conventional brick-and-mortar methods because they are familiar and trusted"* (RPS4Q2). Zhang

et al., [19] and Emma-Ochu et al., [47] both identified cultural conservatism as an impediment to technical progress in developing construction sectors. Similar issues were found in Malaysia and India [35] education campaigns, demonstration projects, and professional training are therefore critical for changing public and industry perspectives [48].

4.2.3 Shortage of Prefabrication Enterprises and Local Production Capacity

Eighty-six percent of participants mentioned a lack of local prefabrication enterprises, resulting in dependency on imported components. One participant said: *"Some of our items have yet to be produced locally due to limited demand; we import directly from our parent firm in Europe when unique components are required" (*RPS4Q5). This is consistent with Akinola et al., 2024 [5] who define Nigeria's off-site construction ecology as structurally underdeveloped. In contrast, regional production hubs in Europe and Australia have increased coordination and delivery efficiency (Minunno et al., 2018 [15]; Steinhardt et al., 2020)[39] . Creating regional prefabrication clusters in Lagos, Abuja, and Port Harcourt could encourage local innovation and knowledge transfer.

4.2.4 Logistics, Transportation, and Safety Concerns

Sixty-four percent of respondents noted logistical impediments, including inadequate roads, instability, and expensive transportation expenses. Safety concerns, including as theft and component damage during transit, were also raised. These findings are consistent with those of Li et al., (2021) [12] and Okafor et al., (2022)[20], who found logistics to be a major barrier for prefabrication in emerging economies. Effective logistics underlies the framework's "Just-in-Time Delivery Efficiency" element. Developed economies use digital logistics platforms and GIS-based routing Wu et al., (2021) [41] while Nigeria lacks such systems, resulting in time delays and increased expenses. It is proposed to strengthen public-private logistics collaborations and insure transportation risks.

4.2.5 Design Innovation and Component Flexibility

Respondents pointed out that prefabricated systems have limited design flexibility. Components are frequently fixed-module, which limits customisation. However, novel materials, like as expanded polystyrene (EPS) and polyurethane (PU), are developing as lighter, more thermally efficient panels. Barlow et al. (2003) [49] and Doe (2021) [50] identified similar problems, claiming that adaptable modular systems improve market adoption. Encouraging R&D collaborations among architects, engineers, and material scientists has the potential to improve customisation and increase acceptance in Nigeria.

4.2.6 Technical Expertise and Skill Gaps

Over 70% of participants reported a shortage of competent workers in design, manufacturing, and installation. One made the observation: *"It is easier to get workers for conventional methods than for prefabricated construction"* (RPS7Q3). Bello et al., (2025) [51] and Sadiq et al., (2025) [52] confirmed that low technical capacity and digital literacy impede innovation adoption. Addressing these gaps requires tailored training, occupational curriculum, and international apprenticeship programs.

4.2.7 Financial Barriers and Investment Constraints

Twenty-six participants identified inadequate access to finance as a significant barrier. High interest rates and a lack of cheap finance limit growth. *"We started production about 12 years ago, but expansion has been difficult due to lack of access to credit facilities"* (RPS4Q2). According to Mei et al., (2024) [53] and Salama et al., (2020) [54], prefabrication is capital-intensive and thrives in environments where governments encourage early investment. Establishing innovation funds or PPP-based credit schemes may stimulate private-sector participation.

4.2.8 Integrating Empirical and Conceptual Insights

Qualitative insights and a conceptual framework suggest that effective supply chain coordination requires digital information integration, collaborative procurement, optimised logistics systems, and strong institutional frameworks with financial and policy incentives. These interconnected aspects embody the Construction 5.0 vision of human-centered, technology-enabled, and sustainability-driven construction (Cao et al., 2017;[6] Yitmen et al., 2024 [36]). In summary, it could be argued that (i) Policy and finance deficits are the biggest hurdles to prefabrication adoption. (ii) Digital integration, stakeholder cooperation, and logistical innovation are key enablers. (iii) Local manufacturing capacity and skill development are crucial for long-term growth. (iv) Supportive regulations and investment frameworks can make prefabricated houses a feasible solution to Nigeria's housing deficit. Overall, attaining innovation in prefabricated housing supply chains necessitates coordinated policy, technological investment, and human capital development in accordance with Construction 5.0 principles.

5. CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Conclusion

This study investigated novel ways to supply chain coordination in Nigeria's prefabricated house industry, with a focus on key actors such as materials suppliers, prefabricators, logistics providers, and construction experts. The qualitative findings revealed that Nigeria's present prefabrication ecosystem is undeveloped, with fragmented supply chains, poor policy frameworks, low awareness, and inadequate local manufacturing capacity. The study demonstrated that successful coordination of prefabrication supply chains necessitates multidimensional innovation—technological, institutional, and human. The suggested framework includes four important dimensions: information integration, collaborative procurement, logistics efficiency, and policy/institutional support. The interplay between these factors demonstrate that supply chain effectiveness is dependent not only on technological inputs, but also on how stakeholders coordinate knowledge, trust, and information flow across organisational boundaries.

Within the Construction 5.0 paradigm, this study emphasises the concept that technology should serve human-centric goals such as improving collaboration, decreasing waste, and encouraging sustainable home delivery. Digital solutions like as Building Information Modelling (BIM), blockchain-based procurement, and Internet of Things (IoT)-enabled logistics offer opportunity for Nigerian prefabrication workflows to be synchronised. However, its implementation necessitates enabling policies, capacity development, and financial assistance methods. Finally, the study suggests that prefabricated housing offers a transformative chance to close Nigeria's housing deficit—if combined with breakthroughs in supply chain coordination and institutional reform. The integration of digital technologies, improved logistics, and collaborative partnerships has the potential to significantly improve delivery efficiency, quality, and affordability—all of which are core goals of both the National Housing Policy (2021) and UN Sustainable Development Goal 11 on Sustainable Cities and Communities.

5.2 Policy Recommendations

Develop a national framework for prefabricated construction.

The Federal Ministry of Works and Housing, in partnership with the Nigerian Building and Road Research Institute (NBRRI), should create the National Framework for Industrialised and Prefabricated Construction (NFIPC). This framework should standardise prefabrication techniques, provide performance benchmarks, and foster interoperability among stakeholders. Such institutional coordination would decrease duplication, increase efficiency, and strengthen regulatory supervision.

Introduce Fiscal and Regulatory Incentives

To encourage investment, the government can provide tax breaks, import duty waivers, and low-interest financing for manufacturers and developers who use prefabricated technologies. Lessons from China and the United Kingdom demonstrate that incentive policies hasten industry maturity. The inclusion of prefabrication incentives in Nigeria's National Building Code and Infrastructure Master Plan might result in a more predictable policy environment.

Promote Digital Transformation of the Construction Supply Chain

Integrating Construction 5.0 technologies (BIM, cloud-based project platforms, and IoT-enabled logistics) can improve data exchange and transparency throughout the prefabrication value chain. Government agencies and commercial developers should require digital coordination tools for large public housing projects. This will improve real-time decision-making, monitor logistics efficiency, and reduce material waste.

Support Local Manufacturing and Material Innovation

The development of regional prefabrication hubs in Lagos, Abuja, and Port Harcourt should be prioritised. These centres would include modular manufacturing, material testing facilities, and research laboratories. Public-private partnerships (PPPs) could be used to boost local manufacturing of lightweight panels, connectors, and insulation systems, lowering reliance on imports and providing job opportunities.

Develop Technical Capacity and Skills

To address Nigeria's skill shortage, professional organisations such as the Nigerian Institute of Architects (NIA), Council for the Regulation of Engineering in Nigeria (COREN), and Nigerian Institute of Building (NIOB) should work with universities and polytechnics to implement Construction 5.0-aligned training modules. Vocational certification in prefabrication assembly, digital design, and logistics coordination would improve industry readiness and professionalism.

Strengthen Collaborative Procurement Models

Public and private developers should use integrated procurement models, such as Early Contractor

Involvement (ECI) and Integrated Project Delivery (IPD), to foster stakeholder collaboration and risk-sharing. These approaches can increase confidence and openness in the prefabrication supply chain, as well as eliminate conflicts that frequently cause project delays.

Encourage Research, Development, and Demonstration (RD&D) Projects

Funding should be devoted towards practical research that evaluates novel prefabrication systems in Nigeria. Pilot home estates that demonstrate modular building should be constructed in collaboration with universities, research institutes, and private companies. Such projects can provide empirical data, justify cost and time savings, and illustrate environmental advantages to legislators and the general public.

5.3 Theoretical and Practical Implications

Theoretically, this study advances construction management expertise by combining supply chain coordination theory with Construction 5.0 and prefabrication discourse in developing countries. It offers a paradigm for comprehending the social, digital, and institutional aspects of coordinating. Practically, it provides a road map for Nigerian politicians, developers, and manufacturers to improve prefabrication practices through focused interventions in policy, technology, and human resources.

5.4 Future Research Directions

Future research should use mixed-method techniques that include case studies, network analysis, and simulation modelling to quantify the effects of coordination on project performance measures such as cost, time, and waste reduction. Comparative investigations with different African and Asian contexts could improve our understanding of scalability pathways for prefabricated home innovation. Nigeria is at a critical point in its housing and infrastructure development path. Embracing prefabrication through coordinated supply chain innovation provides a feasible path to more sustainable, affordable, and inclusive housing. By adhering to Construction 5.0 principles, Nigeria can not only modernise its construction ecosystem but also progress towards a digitally integrated, human-centric, and resilient built environment capable of meeting the National Housing Policy and the Sustainable Development Goals.

5.5 Limitations of the Research

While the qualitative approach provides rich contextual insight, some drawbacks are acknowledged: (i) Limited statistical generalisability due to the study's purposeful sample size of 28 individuals. However, the goal is theoretical generalisation, with findings applicable to similar circumstances. (ii) Researcher bias was minimised by maintaining reflexivity throughout data processing. (iii) The study area focusses on Lagos, which is the most active prefabrication hub in Nigeria, but may not fully represent regional differences.

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