

# Barriers Associated with the Adoption of Building Information Modelling (BIM) in the Nigerian Construction Sector

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**Abstract** - Building Information Modelling (BIM) is increasingly recognized as a transformative technology in global construction, with benefits such as enhanced cost control, reduced rework, enhanced collaboration, and better lifetime asset management. However, its adoption in Nigeria's construction sector is still unequal and slow. This paper uses scholarly research, policy documents, and comparative institutional reports to examine several barriers to BIM adoption in Nigeria.

The 10 themes of impediments identified were: technological, financial and economic, educational and human capital, organizational and cultural, legal and regulatory, market and client-driven, comparative and Cross-National reflections, influence of the informal sector, institutional Readiness and Capacity Deficits, and socioeconomic factors. The findings indicate that the industry has challenges such as a significant skills gap, costly software, inadequate digital infrastructure, and resistance to organizational change. The lack of institutional support and the absence of a national BIM policy exacerbate the challenges.

Most significantly, the research highlights barriers, such as the dominance of the unorganized sector, a lack of institutional capacity, and macroeconomic instability, that significantly affect Nigeria's adoption of BIM. These findings demonstrate the need for a thorough, systems-thinking approach to BIM implementation.

The report concludes that in order to solve these challenges, Nigeria must put in place a coordinated approach, including all pertinent stakeholders, including the government, educational institutions, the business sector, and professional groups. Funding sources, curricular integration, capacity-building initiatives, and policy development are essential to advancing BIM adoption from theory to reality. In addition to contributing new perspectives to the discussion, this

analysis establishes the framework for future empirical research and legislative efforts.

**Keywords:** Barriers, Adoption, Building Information Modelling (BIM), Nigerian Construction Sector.

## I. INTRODUCTION

The Nigerian construction industry is at an essential moment in its developmental stride. From my experience in academia and practice, I have repeatedly encountered a persistent gap between the growing awareness of digital technologies and their actual implementation on project sites. Building Information Modeling (BIM) is one of the most discussed yet least adopted innovations. BIM is often presented as a silver bullet for the challenges plaguing construction delivery on various platforms, including academic conferences, industry seminars, and policy dialogues. However, in practice, the pace of adoption in Nigeria appears slow, fragmented, and largely restricted to a few forward-looking firms.

This contradiction between theoretical enthusiasm and practical inertia sparked my curiosity. Why is BIM adoption in Nigeria growing at a slow pace despite its well-documented benefits? Why are public sector projects still predominantly paper-based? Why is there a mismatch between what is taught about BIM in our universities and what is practiced on construction sites? These questions underscore the need to unpack the multifaceted barriers that hinder BIM integration within the local construction ecosystem.

At a time when digital transformation is no longer optional but essential, understanding the barriers to BIM adoption is not just an academic exercise. It is a practical necessity. Building information modeling has the potential to transform how buildings and infrastructure are conceived, designed, constructed, and managed. It supports collaboration among stakeholders, reduces construction waste, enables accurate cost estimation, and enhances lifecycle asset management. Yet, in Nigeria, BIM is still often misunderstood

as simply another software package rather than a collaborative process involving workflows, standards, policies, and cultural shifts.

Building information modeling is globally acknowledged as a revolutionary approach in the architecture, engineering, and construction (AEC) sector. It allows for the creation of intelligent models that integrate data throughout the lifecycle of a construction project, enabling better collaboration, coordination, and decision-making [13]. The integration of BIM has resulted in improved cost and time efficiency, risk mitigation, and quality control in many developed economies [21] [8].

Globally, countries such as the United Kingdom, Singapore, Australia, and the United States have adopted BIM as a standard for project delivery, aided by government resolve, capacity-building strategies, regulatory frameworks, and a culture of innovation. In contrast, Nigeria's BIM journey is hampered by a combination of contextual, institutional, and operational barriers [20]. Although awareness is gradually increasing among professionals, the actual use of BIM in real-life projects remains minimal, especially among small- and medium-sized local firms. Adoption efforts are further constrained by factors such as high initial implementation costs, limited digital infrastructure, resistance to change, insufficient technical expertise, and the absence of coherent policy or legislative backing [1] [10] [25] [24]. This article presents a comprehensive review of existing literature on the barriers hindering BIM adoption in the Nigerian construction industry. It consolidates insights from scholarly research, professional practice, and global experiences to offer a structured understanding of the challenges facing BIM implementation in Nigeria.

In addition, it contributes new knowledge by highlighting often-overlooked factors such as client perceptions, informal sector influences, institutional readiness, and the socio-economic context that shape BIM adoption trajectories.

Ultimately, this review article aims to guide policymakers, educators, construction professionals, and industry regulators toward informed decisions. By addressing the complex interplay of challenges inhibiting BIM's full integration, the paper underscores the need for a paradigm shift: one that views BIM not as a futuristic luxury but as an essential driver of productivity, quality, and innovation in Nigeria's construction industry.

## II. LITERATURE REVIEW

### 2.1 Barriers associated with the adoption of Building Information Modelling

BIM usage is still vastly inconsistent, particularly in developing countries, even though its benefits, such as enhanced asset management, clash detection, better cost estimation, and fewer rework, are well recognized. Due to several organizational, financial, legal, educational, and market-based barriers, BIM adoption is limited and slow in Nigeria's construction industry. This literature review offers a comprehensive overview of the present issues, broken down into thematic categories, to encourage better understanding.

#### 2.1.1 Technological Barriers

BIM is essentially technology-driven and relies on advanced digital infrastructure to support model production, interdisciplinary collaboration, and data integration. However, Nigeria's construction industry is beset with structural technological flaws [15]. Older hardware systems, expensive software licensing, and restricted access to reliable internet are significant obstacles [7] [17]. In the settings where many organizations operate, stable energy and cloud-based computing, both essential for collaborative BIM workflows, are not always available.

#### 2.1.2 Financial and Economic Barriers

The cost ramifications of implementing BIM are yet another major barrier. For firms operating in Nigeria's unpredictable economic environment, the initial cash outlay required for hardware improvements, organizational reorganization, training, and software procurement might be daunting [19] [2]. The bulk of SMEs, which form the backbone of the Nigerian construction industry, lack access to affordable financing or government incentives that would facilitate digital investment [12]. This has greatly affected the resolve of these firms towards adopting and purchasing the relevant digital investments that will improve their overall processes.

#### 2.1.3 Educational and Human Capital Barriers

One of the main issues facing construction professionals is the skills gap. IT literacy, project management, engineering concepts, and architectural design are all interdisciplinary skills required for BIM. Unfortunately, many Nigerian construction professionals are not familiar with even the most basic BIM ideas, much less how to use them in real-world scenarios [26] [9].

In terms of curriculum adaptation to the trends in digital construction, technical colleges and other postsecondary

educational institutions are also falling behind. Most of the time, BIM instruction is theoretical and does not include hands-on practice with Tekla Structures, Revit, or Navisworks. Institutions find it challenging to acquire licenses or operate fully functional digital labs due to financial constraints [5].

#### **2.1.4 Organizational and Cultural Barriers**

Organizational readiness is a requirement for a successful BIM integration. In addition to putting a technology in place, BIM involves reengineering existing workflows, decision hierarchies, and communication patterns. Many Nigerian construction enterprises are resistant to change and would want to continue using antiquated methods and systems, especially those that are bureaucratic, family-run, or traditional [18]. Concerns about losing one's job, the perceived difficulty of BIM tools, or a lack of clarity [22] regarding changes to roles and responsibilities are common causes of this resistance. Furthermore, there is a cultural emphasis on segregated work and hierarchy, which contradicts the integrative and collaborative mindset required by BIM workflows.

#### **2.1.5 Legal, Regulatory, and Policy Barriers**

Nigeria's institutional and legal structure is inadequate for regulating digital construction. There is no national BIM implementation strategy or legal framework mandating the use of BIM for public projects, and there are no defined standards for BIM execution plans (BEPs), model maturity levels, or data transfer protocols. [16] State that to facilitate the adoption of BIM, legal considerations should address the following difficulties: ownership, liability for inaccuracy, licensing issues, insufficient national standards, and lack of information sharing in BIM.

Reports by [28] show that countries like the UK, Singapore, and Australia have successfully scaled their adoption of BIM thanks to top-down government requirements, industry standards, and regulatory incentives. However, Nigeria's digital technology sector is mostly uncontrolled, and deliverables based on BIM are typically not required by public clients. Firms, many of whom lack the expertise or motivation to lead change, are left to handle all implementation decisions due to this policy vacuum.

#### **2.1.6 Market, Client, and Industry-Driven Barriers**

Market structure and customer attitudes play a major role in encouraging (or hindering) the adoption of BIM. Most Nigerian construction clients, especially those in the public sector, are unaware of BIM's benefits. Because of this,

demand is lower, which limits supply and inhibits the creativity of consultants and contractors [3].

Even for private clients, BIM is rarely used in tender documents or project performance indicators. Furthermore, Nigeria's construction industry is a largely informal and fragmented market because many projects are completed without formal contracts or integrated project delivery frameworks. It is difficult to apply BIM's organized, data-driven methodology in such a situation.

#### **2.1.7 Comparative and Cross-National Reflections**

A worldwide review provides useful background information on Nigeria's challenges with BIM adoption. When the UK government required Level 2 BIM to be used in all public infrastructure projects in 2016, adoption was significantly boosted [11]. Singapore's Building and Construction Authority (BCA) developed a BIM roadmap that outlines model submission standards as well as training incentives and subsidies.

These countries demonstrated that coordinated action, through legislation, capacity building, education, and financial support, is necessary to overcome the inertia in the implementation of BIM. Nigeria can learn from these events by applying similar strategies to its own institutional and socioeconomic conditions.

#### **2.1.8 Influence of the Informal Sector**

The considerable informal sector, which operates outside of conventional regulatory frameworks and professional norms, is a notable aspect of the Nigerian building industry. Informal sector participants are typically more reliant on traditional techniques and less exposed to advances like BIM. Documentation resistance, formal training exclusion, and a lack of professional networks all hinder the widespread use of BIM. Additionally, because many clients choose informal practitioners because they believe they are more flexible and cost-effective, the incentive to engage in BIM, which is perceived as formal, costly, and technical, is reduced [27].

#### **2.1.9 Institutional Readiness and Capacity Deficits**

Institutional preparedness, or the ability of public and private institutions to promote and enforce BIM integration, is another significant but little-discussed barrier. Numerous government ministries, regulatory bodies, trade associations, and academic institutions influence digital construction policy and practice. However, most of these institutions in Nigeria are either underfunded, sluggish to innovate, or lack the political will to encourage the adoption of BIM [6].

### 2.1.10 Socio-Economic Context and Adoption Trajectories

The broader socioeconomic context of Nigeria has a major influence on the country's adoption of BIM. Long-term investments in digital transformation are challenging for construction enterprises because of factors such as macroeconomic instability, rising inflation, and fluctuating exchange rates [23]. High software expenses, which are often dollar-denominated, become even more unsustainable due to currency devaluation.

Poverty and unemployment also influence the labor market by pushing companies to reduce costs by skipping costly high-tech expenditures or training initiatives. BIM is sometimes seen as a "luxury" rather than a requirement in this sense, particularly by small-scale clients and contractors whose main concern is project survival rather than optimization.

### III. METHODOLOGY

A comprehensive literature review method was employed to identify, classify, and define the barriers associated with the adoption of Building Information Modelling (BIM) in the Nigerian construction sector. This approach is supported by [4] [27], who utilized a similar approach in their studies. Ensuring methodological rigor, transparency, and replicability is the goal of the review. Using a qualitative, narrative-based review approach with an emphasis on thematic categorization, the study aimed to integrate data from both local (Nigerian) and global settings to provide a thorough understanding of the subject. Relevant literature was gathered from academic theses, conference proceedings, peer-reviewed publications, and institutional reports. ResearchGate, Taylor & Francis Online, ScienceDirect, Google Scholar, Emerald Insight, and Scopus were among the databases that were used. Government policy documents and trade magazines were used as additional sources of information. The following search phrases were combined and modified to optimize the results: "Digital construction in developing countries," "BIM adoption barriers," "Building information modeling in Nigeria," "Difficulties of BIM implementation," and "Construction technology adoption." Additionally, truncation and boolean operators (AND, OR) were used.

The studies that were included met the following criteria:

It focused on digital innovation, construction technology, and the adoption of BIM in Nigeria and other developing countries.

- Provided empirical facts, expert opinions, or structured reviews.

- Studies that only address technical BIM modeling without addressing adoption concerns, non-scholarly sources with few citations, and papers written in languages other than English were excluded.

The literature was analyzed and conceptually categorized into the following domains: Technological, Financial and Economic Barriers, Educational and Human Capital Barriers, Organizational and Cultural Barriers, Legal, Regulatory, and Policy Barriers, Market, Client, and Industry-Driven Barriers, Comparative and Cross-National Reflections, Influence of the Informal Sector, Institutional Readiness and Capacity Deficits, as well as Socio-Economic Context and Adoption Trajectories. Using a comparative lens, the findings relevant to Nigeria were positioned within worldwide frameworks for BIM adoption.

### IV. FINDINGS

The study concludes that Nigeria's adoption of Building Information Modelling (BIM) is constrained by a complex web of interrelated barriers that span the organizational, financial, educational, legal, and socioeconomic realms. Technological issues that businesses face include unstable internet, insufficient power supply, and outdated technology, all of which are incompatible with the digital and collaborative requirements of BIM. The high cost of software, training, and implementation discourages SMEs from making BIM investments, especially in an uncertain economic environment.

One major challenge is the lack of skilled specialists. Many construction workers and graduates lack the multidisciplinary abilities needed for BIM because of the theoretical teaching techniques used in higher education and the restricted availability of practical technologies. Organizational resistance to change makes the issue worse; many companies are hesitant to restructure traditional workflows or engage in training due to poor client demand and perceived risks.

Without a national BIM strategy or regulatory mandate, adoption decisions are left up to individual stakeholders, resulting in unequal implementation. Structured innovation is further limited by the fact that public clients rarely require BIM outputs and that the construction sector is still mostly unstructured. Crucially, the analysis highlights under-recognized barriers such as the prevalence of practitioners in the unorganized sector, institutional fragility, and socioeconomic volatility. BIM is usually viewed as a luxury rather than a necessity as a result of these factors.

In summary, Nigeria's adoption of BIM is hindered by systemic issues rather than merely technical ones, which calls for coordinated national strategies, legislative modifications,

capacity-building initiatives, and raised stakeholder awareness to encourage long-term transformation in the building industry.

## V. CONCLUSION

This research critically examines the various barriers that Nigeria's construction sector faces when attempting to adopt Building Information Modelling (BIM). Even though the benefits of BIM are becoming more widely recognized, the industry is still structurally unprepared for its widespread adoption due to organizational inadequacies, skill shortages, financial constraints, technology deficiencies, and policy gaps.

The analysis highlights significant but frequently disregarded barriers that have a significant impact on Nigeria's adoption of BIM, such as the predominance of the unorganized sector, institutional weakness, and socioeconomic instability. All of these barriers contribute to a cycle of underdevelopment where innovation is hampered by systemic resistance, low demand, and constrained capacities.

To fully achieve BIM's potential, a concerted national response encompassing the public and corporate sectors as well as professional associations is needed. Examples of strategic interventions include developing a national BIM roadmap, integrating BIM into postsecondary education programs, providing financial support to SMEs, establishing capacity-building programs, and establishing legally enforceable digital construction standards. Nigeria can only get from BIM awareness to significant adoption and implementation by making such deliberate, situation-specific initiatives.

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