

Assessment of Level of Bim Integration into Working Drawing and Specification within the Nigerian Construction Industry

Shafe Ezekiel B., *Amao Abdulkhaliq O., Alagbe Faithfulness Ifeoluwa, Bamidele J. ADEWUMI,
Adekunle O. OGUNNAIKE

Department of Architecture, College of Environmental Science and Management Caleb University,
Imota, Ikorodu, Lagos, Nigeria

*Corresponding Author

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ABSTRACT

Building Information Modelling (BIM) has emerged as a game-changing tool in international construction, enhancing lifecycle efficiency, documentation correctness, and teamwork. But BIM adoption is still low in Nigeria, especially when it comes to creating functional drawings and specifications, which are essential for a project's success. This study investigated the amount of BIM integration into key documentation procedures throughout the Nigerian construction industry.

539 experts from the architectural, engineering, and construction (AEC) fields were given standardised questionnaires as part of a quantitative study design. Responses were analysed using descriptive statistics and the Relative Importance Index (RI). The results show that even while working drawings are produced using BIM programs like Revit and ArchiCAD, many experts still export their outputs into 2D formats for real-world applications. The majority of practitioners prepare specifications manually or as separate documents, and there is little integration of specifications directly into BIM settings. Lack of training, software expense, low client demand, and dependence on conventional CAD systems are some of the main obstacles that have been found.

Notwithstanding these difficulties, the survey discovered that experts are aware of how BIM can improve precision, coordination, and design effectiveness. In order to encourage broad adoption, the study finds that BIM integration in Nigeria is still at the fundamental level and suggests focused training, policy enforcement, and workflow standardisation. This study adds to the current discussion on the digital transformation of the construction industry and provides useful tactics for enhancing the quality of documentation in emerging economies using BIM.

Keywords: AEC Industry, Building Information Modelling (BIM), Construction Technology, Specifications.

Word Count: 4686

INTRODUCTION

In the architecture, engineering, and construction (AEC) sector, Building Information Modelling (BIM) is a game-changing digital approach that improves sustainability, efficiency, and teamwork. BIM, which is defined as the creation and administration of digital representations of a location's functional and physical attributes, enhances project results by promoting improved data integration and stakeholder collaboration over the course of the building lifecycle. (Charles Olaiya, Bamidele George Fadugba, Olaolu Muhammad Lawan, Mustapha, 2024; Małgorzata Kurcusz, Karolina Krysińska Kosakiewicz, Michał Maurycy Naliwajko, Zofia Jabłońska Karolina, Radecka Ewa Grzegorzewska, Michał Sieczych, Eliza Ferenc-Pupek Stefańska, Anna., 2024)

Globally, BIM adoption is influenced by government regulations, technical standards, and digital maturity. However, in Nigeria, BIM is primarily utilised for architectural design rather than for comprehensive project

delivery or documentation management (Olanrewaju, Oludolapo Ibrahim Babarinde, Sunday Ajiboye Chileshe, Nicholas Sandanayake, Malindu, 2021). Despite growing awareness, the integration of BIM into critical construction documentation, particularly working drawings and specifications, remains underdeveloped (Andreea, Grecu, 2022; Daura, Buhari Nuhu, Taib, Mariati Md Husain, Nadiyah Taib, Aizat Mohd, 2024; Owolabi, Harry, Adewumi, Onamade, Alagbe, 2024). This limits its potential to drive accuracy, reduce rework, and improve coordination between design and construction teams (Shewale, Manisha Khartode, Bhagyashree Shinde, Nitin Sawadkar, Sushma, 2023).

Specifications and working drawings are crucial parts of construction documentation. While specifications include written directions on standards, performance, and workmanship, working drawings provide comprehensive pictorial instructions that include measurements, materials, and assembly (Adewumi, Asaju, Bello, Atulegwu F, Ososesele, David-Mukor, Otuonuyo, Ogunyemi, 2025; Asaju, Adewumi, Onamade, Alagbe., 2024). When these papers are successfully integrated into a BIM environment, disparities may be decreased, procurement can be enhanced, and project goals can be met (Adewumi, A, et al., 2025; Oluseye Oseghale, Godwin Ehis Aigbavboa, Clinton, 2023; A'la, Rafi Nurul, 2022; Olugboyega). But because of obstacles, including exorbitant software costs, poor training, and a lack of institutional support, this integration is rarely accomplished in Nigeria (Toyin & Mewomo, 2023; Adewumi, Onamade, Asaju, Adegbile, 2023; Aka, AdefemiIji, Justina Isa, Rasheed Babatunde Bamgbade, Adebisi Abosede, 2021)

Research shows that even though some private sector projects have implemented BIM successfully at the design stage, its broader use in working drawing production and specification management remains minimal (Olugboyega, Oseghale, Aigbavboa, Clinton, 2023) (Adewumi, et al., 2025). Barriers, including fragmented project delivery models, resistance to change, and the absence of national BIM standards, continue to slow progress ("An Empirical Analysis of BIM Implementation in the Nigerian Construction Industry: Preliminary Results," 2023; Olanrewaju, Oludolapo Ajiboye Babarinde, Sunday Salihu, Comfort., 2020).

As a result, a thorough evaluation of the integration of BIM into working drawings and specifications in the Nigerian construction sector is required. To improve project performance, this study aims to determine the present acceptance status, investigate implementation issues, and highlight methods for improving BIM-based documentation processes.

Although widely acknowledged for improving project efficiency, cooperation, and documentation quality, Building Information Modelling (BIM) has not been widely adopted in Nigeria's construction sector. Lack of qualified personnel, high implementation costs, little government assistance, and inadequate training programs are some of the ongoing obstacles (Adewola et al., 2023; Amade et al., 2024; O. Olanrewaju et al., 2020). The lack of established BIM protocols exacerbates these problems by limiting collaborative workflows and undermining the potential advantages of BIM in the Nigerian setting (Babatunde et al., 2020; O. Olanrewaju et al., 2020).

The integration of BIM with working drawings and specification documentation is a crucial area. Accurate design communication, material compliance, and quality control all depend on these elements. Nonetheless, the majority of AEC professionals in Nigeria continue to use conventional 2D drawings and verbally conveyed specifications, which are frequently given during site meetings (Alugbue et al., 2024). This disjointed strategy leaves space for errors in quality assurance, contractor misunderstandings, and inconsistencies (Emesiobi et al., 2024). Additionally, coordination and traceability throughout project phases are limited since working drawings and specifications are rarely included in BIM environments (Adewumi, et al., 2025).

Limited knowledge of parametric modelling, a dearth of contract frameworks focused on BIM, and inadequate documenting of design choices all contribute to this gap between digital design tools and documentation practices (Bouhmoud & Loudyi, 2020; Chertkov, 2022; Zahedi et al., 2022). The industry still faces issues with cost overruns, rework, and subpar facility lifecycle results in the absence of digitalised and standardised specification workflows, especially in densely populated areas like Lagos (Hassan et al., 2024; Oru et al., 2024).

Immediate tasks include assessing the state of documentation practices and determining the most effective way to integrate BIM into working drawings and specifications. This gap needs to be filled in order to properly employ BIM in improving design quality, construction accuracy, and facility management outcomes across the Nigerian construction industry.

This study's main goal is to evaluate the degree to which the Nigerian construction industry has included Building Information Modelling (BIM) into the process of creating working drawings and specifications. This study intends to investigate how Nigerian architecture, engineering, and construction (AEC) professionals are utilising BIM tools to create, manage, and coordinate design documentation, especially working drawings and specifications, which are essential to project delivery as global construction practices shift towards digital workflows.

In order to achieve the above aim, the following objectives have been set: evaluate the current level of BIM awareness and adoption among AEC professionals in Nigeria regarding working drawings and specifications; identify the specific BIM tools and platforms used for generating and managing working drawings and specification documentation; assess the challenges and barriers to effective BIM integration into the documentation process in Nigerian construction projects; investigate how BIM influences the accuracy, consistency, and coordination of working drawings and specifications in real-world Nigerian projects; and, propose recommendations for improving the adoption and integration of BIM in documentation workflows across the Nigerian construction industry.

Project quality, communication, and lifecycle performance are all directly impacted by the use of BIM in working drawings and specification processes, which makes this study important. The absence of properly organised documentation in Nigeria frequently leads to mistakes, rework, material waste, and cost overruns. (Adewumi, et al., 2025; Emesiobi et al., 2024). While BIM has the potential to resolve these inefficiencies by enabling accurate, parametric, and data-rich design outputs, its actual integration remains limited and poorly documented in Nigeria (Adewola et al., 2023; Amade et al., 2024).

Therefore evaluating the current state of BIM documentation practices in Nigeria, this research will: provide evidence-based insights into documentation inefficiencies and gaps; help inform policy, curriculum, and industry training efforts to strengthen digital documentation capacity; encourage standardisation and structured BIM workflows, especially for specifications, which are often neglected in BIM discussions (Alugbue et al., 2024) and, support Nigeria's broader transition toward sustainable and technology-driven construction in line with global best practices.

LITERATURE REVIEW

Definition and Components of BIM

The digital process known as Building Information Modelling (BIM) makes it possible to create, use, and manage intelligent 3D models and associated data throughout the lifecycle of a structure. Therefor by combining geometrical data with schedule, cost, performance, and facility management data, BIM goes beyond conventional 2D drafting and promotes improved stakeholder engagement and decision-making (Charles Olaiya et al., 2024; Małgorzata Kurcjuś et al., 2024)

BIM is often defined by two key frameworks: **BIM levels** and **BIM dimensions**. The levels of BIM (0 to 3) represent the maturity of collaboration in information modelling.

- **Level 0** signifies unmanaged CAD, primarily 2D drawings without any collaboration.
- **Level 1** involves the use of 2D and 3D CAD with limited collaboration.
- **Level 2**, which is commonly referenced in developing contexts like Nigeria, involves collaborative working with separate discipline models shared through a common data environment (CDE).

- **Level 3** envisions full integration of models in a shared environment, promoting real-time collaboration and cloud-based data exchange (Daura et al., 2024; Toyin & Mewomo, 2023).

In terms of dimensions, BIM extends beyond 3D modelling to include:

- **4D (time):** Integrates scheduling to visualise construction sequencing.
- **5D (cost):** Embeds cost estimation and budgeting into the model (Andreea, 2022; Shewale et al., 2023).

More advanced applications also include **6D (sustainability)** and **7D (facility management)**, particularly relevant for long-term infrastructure performance.

The tools commonly used to implement BIM processes include platforms like **Autodesk Revit**, **ArchiCAD**, **Navisworks**, and **Bentley Systems**. These tools support model-based workflows that enhance visualisation, clash detection, and interdisciplinary coordination (A'la, 2022; Aka et al., 2021). However despite the global availability of these tools, their use in Nigeria is mostly limited to design tasks by architects, with minimal implementation across full project lifecycles or integrated documentation (Adewumi, et al., 2025; O. I. Olanrewaju et al., 2021; Olugboyega et al., 2023).

BIM and Working Drawings

Working drawings, which include exact measurements, construction techniques, and material requirements, are comprehensive visual documents that serve as a guide for the actual building process. These drawings are often created by hand or using 2D CAD software. However, by enabling the direct extraction of 2D construction documents from coordinated 3D models, BIM improves and automates the creation of working drawings (A'la, 2022; Di Giuda et al., 2020).

Drawings and the model are constantly in sync thanks to this automation. All related drawings, including plans, sections, and elevations, automatically update when the BIM model changes, minimising human error and enhancing drawing consistency (Shewale et al., 2023). Furthermore, BIM platforms transform drawings into more than just visual aids by incorporating construction intelligence into them, such as material quantities, fire ratings, and structural characteristics.

In the Nigerian construction context, however, the use of BIM for generating working drawings is still in its infancy. Many professionals still rely on AutoCAD and manually coordinate updates, which often leads to inconsistencies and time-consuming revisions (Olugboyega et al., 2023). BIM's potential to improve the efficiency and reliability of working drawings is not yet fully realised due to skill shortages, resistance to workflow changes, and the absence of project delivery standards that mandate BIM-based documentation (Daura et al., 2024; O. Olanrewaju et al., 2020).

Nigerian AEC workers can increase collaboration, decrease rework, and streamline documentation by incorporating BIM into working drawing preparation. When properly implemented, BIM-based working drawings benefit construction teams as well as procurement, facilities management, and coordination with specification papers. (A'la, 2022; Rahman & Sainati, 2022).

BIM and Specifications

Specifications are detailed written descriptions that outline the materials, standards, workmanship, and quality requirements for construction (Owolabi et al., 2024). Traditionally, specifications exist separately from design drawings, leading to issues of coordination, misinterpretation, and errors during execution. However, Building Information Modelling (BIM) provides an opportunity to embed specification data directly within model elements, creating a more integrated and intelligent documentation process (Di Giuda et al., 2020; Rahman & Sainati, 2022).

Through object-based modelling, BIM links material and performance specifications to specific components in the digital model—walls, floors, windows, HVAC systems—allowing real-time access to information such as

material grade, installation standards, and compliance requirements. This tight integration reduces duplication of information, ensures traceability of design decisions, and facilitates improved communication between designers, contractors, and facility managers (Andreea, 2022; Asaju, 2024; Zahedi et al., 2022)

In more complex applications, BIM-based specifications facilitate the automation of quality checks and quantity take-offs, which has a direct impact on the processes of on-site verification and procurement (Shewale et al., 2023). A change to a material in the BIM model, for instance, instantly updates the related specification, cost information, and schedule data—an efficiency that is practically unattainable in conventional workflows.

Despite these benefits, research shows that specifications are infrequently incorporated into BIM models in Nigeria. According to Alugbue et al. (2024) and Adewumi et al. (2025), the majority of AEC professionals still prepare them by hand or as external documents, which are frequently presented orally during site meetings. This creates uncertainty and restricts accountability. This discrepancy compromises quality control and lessens BIM's ability to assist project delivery and lifecycle performance.

More focus must be placed on educating professionals to connect specification data to digital models and create standardised model-based specification templates that take into account regional materials and practices if BIM is to fulfil its full potential in Nigeria's construction sector (Dayomi, Adewumi, Alagbe, Onamade, Adegbile, Onyikeh, Otuonuyo, 2025; Olugboyega et al., 2023; Toyin & Mewomo, 2023)

Global Trends in BIM Integration

Internationally, BIM has become a foundational tool for improving construction documentation, especially working drawings and specifications. Countries such as the UK, Finland, Singapore, and the United States have implemented national BIM mandates or roadmaps, which have accelerated integration across public and private construction projects (Charles Olaiya et al., 2024; Małgorzata Kurcusz et al., 2024). These mandates typically require collaboration across disciplines through shared BIM models that include coordinated drawings and embedded specifications.

Case studies show that in countries with mature BIM practices, the benefits are tangible. For instance, the **Edusmart Soerojo Hospital Project in Indonesia** successfully implemented BIM to generate *Mutual Check-0* (MC-0) documents—integrated working drawings and specifications used for design validation before construction. BIM enables early clash detection, precise specification tracking, and streamlined stakeholder communication, reducing both errors and project delays (A'la, 2022).

In Europe, projects using **BIM Level 2 or Level 3** frameworks routinely employ platforms such as Revit, ArchiCAD, or Navisworks to generate fully coordinated drawing sets with specifications, cost data, and construction schedules embedded within the model environment (Di Giuda et al., 2020; Rahman & Sainati, 2022). These workflows improve documentation accuracy and transparency, supporting both real-time project collaboration and downstream facility management.

On the other hand, Nigeria's dearth of these integrated workflows reveals a significant weakness in the use of digital building. Despite increased awareness, BIM is still mostly used for design-focused documentation, especially specifications (Aka et al., 2021; O. Olanrewaju et al., 2020). Policy assistance, industry training, and the modification of international BIM techniques to Nigeria's regulatory, economic, and professional environment are all necessary to close this gap.

BIM Adoption in Nigeria

Building Information Modelling (BIM) adoption in Nigeria has been the subject of an increasing number of academic studies and industry reports, all of which come to the same conclusion: although AEC professionals are becoming more aware of BIM, its actual implementation is still limited and varies across project phases (Amade et al., 2024; Olugboyega et al., 2023; Owolabi et al., 2024). According to research, BIM is mostly used in Nigeria during the design phase, especially by architects. Other fields like project management,

structural engineering, and quantity surveying have not yet fully embraced BIM workflows (Olanrewaju et al., 2021).

Multiple publications have examined the barriers to BIM adoption in Nigeria. Babatunde et al. (2020) identified systemic issues such as weak institutional support and the absence of regulatory mandates. Similarly, the study by Adewola et al. (2023) found that many firms perceive BIM as costly and complex, especially in terms of acquiring software licenses, upgrading hardware, and maintaining skilled technical staff.

The high expense of BIM software and implementation is one of the most commonly mentioned issues, which many small-to-medium-sized Nigerian businesses find unaffordable.

(Adewumi, et al., 2025; Aka et al., 2021; Toyin & Mewomo, 2023) Furthermore, widespread use is hampered by professionals' lack of BIM skills and restricted access to training. Although many practitioners are aware of the potential advantages of BIM, their lack of practical experience with programs like Revit, ArchiCAD, or Navisworks prevents them from adopting it beyond simple 3D modelling. (Adewola et al., 2023; O. Olanrewaju et al., 2020).

Another major issue is the absence of national BIM standards or policy frameworks, which has led to uneven adoption across projects. Unlike countries with centralised BIM mandates, Nigeria lacks a clear path for BIM integration, making it difficult to coordinate training, standards, and collaborative digital practices across the AEC industry (Charles Olaiya et al., 2024; Daura et al., 2024).

The issue is made worse by infrastructure issues, including erratic internet access, antiquated computer systems, and unstable power supplies, particularly in public sector projects or rural construction environments. (Adewumi, et al., 2025; Hassan et al., 2024; Olugboyega et al., 2023; Oru et al., 2024). These restrictions hamper businesses' ability to receive real-time model updates and sustain cloud-based collaboration environments, both of which are essential elements of sophisticated BIM workflows.

Recent studies have shown rare success stories where academic institutions and private sector companies have started implementing BIM training, workshops, and pilot projects in spite of these difficulties (Olugboyega et al., 2023). Although considerable work needs to be done to enable widespread, successful adoption across the Nigerian construction industry, these initiatives show that the benefits of BIM are becoming increasingly recognised.

METHODOLOGY

This study employed a quantitative research design, utilising a structured questionnaire to collect measurable data on the level of Building Information Modelling (BIM) integration in the preparation of working drawings and specifications within the Nigerian construction industry. The choice of a quantitative approach was based on the need to objectively assess patterns, perceptions, and levels of BIM usage among a broad range of professionals in the architecture, engineering, and construction (AEC) sector.

Participants' demographics, the BIM tools they used, their perceptions of the usefulness of BIM in documentation processes, and their level of integration with working drawings and specifications were all recorded in the questionnaire. Finding trends, difficulties, and regions with low or high BIM integration was made possible by the implementation of a structured instrument, which also made statistical analysis simple and allowed for consistent replies.

Professionals in the Nigerian architecture, engineering, and construction (AEC) sector who prepare and utilise working drawings and specifications were among the study's target demographic. This comprised surveyors, engineers, contractors, and architects engaged in both public and private sector projects.

Respondents with pertinent expertise in BIM tools and documentation procedures were chosen using a purposive sampling technique. The survey included 539 industry professionals from several states in Nigeria,

including Lagos State, the nation's building capital, which accounted for 87.94% of the sample. Among the experts represented were:

- Architects: 32.10%
- Contractors: 14.29%
- Engineers: 11.32%
- Surveyors: 14.10%
- Others/NIL: 28.19%

This sampling ensured that the study captured insights from stakeholders with direct involvement in the creation and use of working drawings and specifications.

PROFESSIONALS IN THE CONSTRUCTION INDUSTRY				
S/N	Professionals	N=539	percentage (%)	cum%age
1	Contractor	77	14.29	14.29
2	Architect	173	32.10	46.38
3	Engineer	61	11.32	57.70
4	Surveyor	76	14.10	71.80
5	NIL	73	13.54	85.34
6	Others	79	14.66	100.00
		539		

Source: research fieldwork

A systematic questionnaire intended to evaluate Nigeria's degree of BIM integration into working drawings and specifications was used to gather data for this study. There were several components to the digitally delivered questionnaire.

- Demographic information (age, gender, marital status, educational background, years of experience)
- Type of firm and professional role
- Use of BIM tools and software
- Perceived effectiveness of BIM in working drawing preparation
- Integration of specifications within BIM environments
- Digital fabrication, parametric design, and VR/AR technologies in documentation

Using a 5-point Likert scale, respondents indicated how much they agreed or disagreed (1 being strongly disagree and 5 being strongly agree). Because of the consistent responses provided by the questionnaire structure, quantitative analysis of industry-wide patterns and trends was made possible.

Descriptive statistical techniques were used to analyse the information gathered from the questionnaire. The degree of agreement among respondents on important BIM-related factors was assessed using frequencies, percentages, mean scores, and the Relative Importance Index (RI).

The following are important analysis highlights: BIM's ability to increase working drawing accuracy received a mean score of 3.469 and RI = 0.694 (ranked first among functions).

- The mean score for BIM software integration with working drawings was 3.406, with a RI of 0.681.
- The mean score for BIM-assisted design discipline coordination was 3.419, with a RI of 0.684.
- Using parametric design methods to increase working drawings' adaptability resulted in an RI of 0.679.

Data was processed using spreadsheet tools (e.g., Microsoft Excel) to derive insights, and results were presented using tables and charts for clarity.

DATA PRESENTATION AND DISCUSSION

Level of BIM Use in Working Drawings

According to the report, professionals in Nigeria's construction sector regularly use BIM tools, especially when creating working drawings. A sizable portion of the 539 respondents said that their documentation workflows incorporate BIM tools like Revit, ArchiCAD, and comparable platforms.

- With a mean score of 3.469 and a Relative Index (RI) of 0.694, the statement "The BIM tools used improve the accuracy of working drawings" ranked first out of all the BIM related aspects evaluated.
- A mean score of 3.406 (RI = 0.681) was assigned to the statement, "The BIM software used in my projects integrates seamlessly with working drawings."

These findings suggest that although BIM tools are being used, their application is still mostly utilitarian and concentrates on drawing creation rather than completely immersive BIM-based project delivery. For construction documentation, professionals frequently export 2D drawings from BIM platforms, demonstrating a hybrid approach where traditional CAD deliverables are still the standard.

Level of BIM Use in Specifications

Direct specification integration into BIM models is still in its infancy. Despite BIM's ability to incorporate technical standards, performance requirements, and material data into model elements, the survey discovered that respondents used this feature sparingly.

- Despite the availability of tools, "BIM integration in specifications" had a worse score on implicit measures. According to survey data, the majority of experts still manually coordinate specifications with models or drawings and create them as external documents.
- A disjointed documentation process, where the advantages of object-based modelling are not completely realised in reality, is reflected in the absence of automated or linked specifications.

This gap between graphical modelling and textual specifications underscores a key weakness in the current state of BIM implementation in Nigeria.

Barriers to Full Integration

The study identified multiple factors inhibiting full BIM integration into working drawings and specifications:

- **Lack of Training:** Many respondents said they lacked the necessary skills to utilise more complex BIM capabilities than only 3D modelling. The mean score for the BIM tool learning curve was 3.354, indicating modest comfort but potential for development.
- **Problems with Interoperability:** Experts mentioned difficulties sharing information between BIM platforms and other documentation systems, especially when several stakeholders use different tools.
- **Proceeding Use of 2D CAD:** Many businesses still rely on AutoCAD or similar 2D technologies, utilising BIM solely for design visualisation, even in spite of growing awareness of BIM.
- **Low Client Demand:** Incentives for complete adoption are diminished by clients' lax enforcement of BIM deliverables, particularly in public sector projects.

These barriers are consistent with previous studies on Nigeria's BIM landscape (Adewola et al., 2023; Toyin & Mewomo, 2023).

Professionals' Perspectives

Respondents offered valuable insights into their experiences with BIM in daily practice:

- **Parametric Design:** Respondents rated *"Parametric design tools enhance the flexibility of working drawings"* with a mean of 3.410 and RI = 0.682, suggesting that those who use parametric tools find them beneficial.
- **Digital Fabrication:** The use of digital fabrication technologies scored moderately high, with *"Digital fabrication improves the quality of construction"* receiving RI = 0.688.
- **VR/AR Tools:** Adoption remains low, but tools that aid in visualizing working drawings received positive feedback. For example, *"The integration of VR and AR enhances the design review process"* had a mean score of 3.416 (RI = 0.683).

Overall, professionals acknowledge the value of BIM in improving accuracy, reducing errors, and enhancing collaboration. However, they also stressed the need for industry-wide training, standardisation, and policy enforcement to realise BIM's full potential in working drawing and specification processes.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

A structured quantitative approach was used to collect data from 539 industry professionals, including architects, engineers, contractors, and surveyors, to evaluate the degree of Building Information Modelling (BIM) integration into working drawings and specifications within the Nigerian construction industry.

Key findings include:

- **BIM is utilised in Working Drawings:** Many professionals actively utilise BIM systems like Revit and ArchiCAD to create working drawings. However, many practitioners continue to export 2D documentation for on-site usage instead of keeping a workflow that is entirely model based. With a top-ranking mean score of 3.469 and a Relative Index (RI) of 0.694, BIM is regarded for increasing drawing accuracy.
- **BIM Integration in Specifications:** It is still rare to incorporate specification data directly into BIM models. Most professionals handle specifications externally, missing opportunities to reduce paperwork and guarantee consistency between design purpose and material performance.
- **Barriers to Integration:** The study identified key limitations to full BIM implementation, including:

- o Lack of advanced training
- o High software costs
- o Fragmented workflows
- o Limited client demand
- o Reliance on 2D CAD systems

These challenges reflect similar patterns noted in previous studies such as Amade et al. (2024), Olanrewaju et al. (2020), and Adewola et al. (2023).

- **Professionals' Perception:** Surveyed professionals expressed optimism about BIM's potential, especially in enhancing design coordination and documentation quality. However, there is a clear call for policy-driven adoption, improved training programs, and practical support to shift the industry from traditional workflows to full BIM integration.

Conclusion

In Nigeria, the incorporation of BIM into working drawings and specification processes is still in its infancy. The construction sector still uses old documentation methods, namely 2D CAD and unlinked textual standards, even if awareness and partial adoption are increasing.

The benefits of BIM, such as increased coordination, drawing accuracy, and design flexibility, are acknowledged but not completely utilised. The effectiveness and integrity of project documentation are weakened when model-based drawings and specification data are not connected. Widespread implementation is also hampered by fundamental problems such low digital literacy, financial constraints, and lax stakeholder enforcement.

Nigeria's AEC sector must shift from using separate tools to an integrated digital documentation culture, where specifications and working drawings are cooperatively handled within BIM environments during a project, in order to optimise the benefits of BIM.

5.3 Recommendations

Based on the findings, the following recommendations are proposed:

1. Develop BIM Training Programs

- Tertiary institutions and professional bodies should offer **hands-on BIM training**, focusing on model-based drawing production, parametric design, and embedded specifications.

2. Mandate BIM-Based Deliverables

- Government agencies and public clients should establish **BIM adoption policies**, requiring coordinated digital documentation on large-scale projects.

3. Promote Model-Specification Integration

- Industry tools and workflows should emphasize the importance of **linking material, performance, and compliance data directly to BIM elements**, reducing errors from disconnected documents.

4. Support Software Access and Interoperability

- Professional associations can negotiate **institutional licenses or subsidized access** to BIM platforms for small-to-medium practices and promote **interoperability standards** across software.

5. Encourage Private Sector Innovation

- Leading firms using advanced BIM workflows (e.g., Neo Architects, Crystal Stairs Ltd.) should **share best practices** through workshops, seminars, and publications.

6. Further Research

- Future studies should explore **case-based comparisons** of successful BIM integration projects and develop **performance indicators** for evaluating documentation quality improvements.

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