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Impact of Flexibility on Working Drawing and Specification in the Nigerian Construction Industry

***OLAYODE Daniel J., SOUNYO Ayebanengiyefa E., OKON Grace R., ADEWUMI Bamidele J., OGUNNAIKE Adekunle O.**

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

***Corresponding Author**

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ABSTRACT

The Nigerian construction industry continues to face significant challenges, particularly in the areas of project delays, cost overruns, and miscommunication among stakeholders. A major contributor to these issues is the prevalence of rigid and often unclear working drawings and specifications, which hinder effective collaboration and limit the flexibility needed to address unforeseen site conditions or design changes. This study investigates how adopting more flexible documentation approaches, supported by advanced digital tools such as Building Information Modeling (BIM), can enhance project delivery, improve quality outcomes, and strengthen coordination across multidisciplinary teams.

By employing a mixed-method approach—drawing on case studies from construction projects in Lagos and survey data collected from industry professionals—this research provides an in-depth analysis of the root causes of documentation-related inefficiencies. The findings underscore the urgent need for adaptable practices that reflect the complex realities of the Nigerian construction environment, where infrastructural constraints, regulatory gaps, and varying levels of technical capacity often complicate project execution.

In response to these challenges, the study recommends the strategic integration of digital technologies to streamline information flow, the implementation of targeted professional training programs to build competency in modern documentation practices, and stronger regulatory enforcement to ensure compliance with industry standards. Together, these measures aim to foster a more responsive and efficient construction process, ultimately contributing to the timely and successful delivery of projects within Nigeria's rapidly growing built environment.

Keywords: Flexibility, Project management, Quality assurance, Building Information Modeling (BIM), Specifications.

INTRODUCTION

The construction industry in Nigeria plays a vital role in supporting urban expansion and infrastructure development, particularly in major cities like Lagos. (Oru, Adewumi&Asaju,2024; Adewumi, Asaju & Adegbile, 2023) Despite its importance to national progress, the sector suffers from persistent documentation-related challenges (Emesiobi, Otuonuyo, Adewumi, Asaju, & Onamade, 2024). However, the rigidity and limited adaptability of working drawings and specifications have remained a central concern (Alugbue, Otuonuyo, Adewumi, Onamade, & Asaju, 2024). These documents are critical tools for communicating design intent, supporting project coordination, and ensuring quality control, yet they are often treated as static deliverables rather than responsive instruments that can evolve with site realities (Owolabi, Harry, Adewumi, Onamade, & Alagbe,2024).

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Working drawings typically illustrate the design and technical components of a project, while specifications provide detailed written descriptions of materials, standards, and workmanship expectations(Adewumi,Onamade, David-Mukoro,Bamiloye, Otuonuyo, Chukwuka, & Oru,2025). In practice, these documents serve as contractual tools and reference guides throughout the lifecycle of a construction project. However, in the Nigerian context, they are frequently underutilized or poorly integrated, leading to miscommunication, errors, and delays in execution(Hassan,Adewumi&Olukunga,2024). Infrastructural projects in Lagos, such as the Lagos Light Rail and Eko Tower Complex, have experienced setbacks due to insufficient documentation updates and poor alignment between design information and on-site conditions (Owolabi et al., 2024; Emesiobi et al., 2024).

The impact of such rigid documentation practices is most pronounced in fast-paced and high-density urban areas like Lagos, where rapid decision-making and real-time coordination are essential for successful project delivery (Adewumi, Asaju, Bello, Atulegwu, Ibhafidon, David-Mukoro, Otuonuyo, & Ogunyemi, 2025). Professionals often resort to issuing verbal instructions or hand-sketched site revisions because the original documents lack the flexibility to accommodate evolving project demands. These informal methods create inconsistencies, reduce accountability, and contribute to construction waste, cost overruns, and rework (Adewumi, Onamade, Oniyikelu, Otuonuyo, Alagbe, Adegbile, & Dayomi, 2025).

Internationally, flexibility in construction documentation has become a central principle in modern project delivery. Countries like South Korea, the United Kingdom, and the United Arab Emirates have adopted integrated systems that treat specifications and drawings as living documents. These systems often rely on digital platforms such as Building Information Modeling (BIM), which allow real-time updates and automatic synchronization across design, procurement, and implementation teams (Leygonie, Motamedi, & Iordanova, 2022). Through the use of parametric tools and cloud-based platforms, global construction environments have seen improvements in documentation accuracy, stakeholder coordination, and risk management.

However, most Nigerian professionals still rely on traditional documentation methods, often limited to printed drawings and specifications developed early in the design phase. These documents are rarely updated after design approval and are seldom reviewed collaboratively once construction begins. The gap between evolving project realities and static documents often leads to communication breakdowns and quality issues, especially where changes are necessary to address site constraints, budget limitations, or client feedback (Alugbue et al,2024; Owolabi et al,2024)

Therefore given the complexity of modern construction and the dynamic nature of urban environments, there is a critical need for more adaptive, collaborative, and technology-driven documentation systems (Asaju,Adewumi,Onamade&Alagbe,2024). Moreover in this need, It requires both an understanding of the current state of construction documentation in Nigeria and a comparison with international best practices. It also calls for the identification of policy gaps, institutional barriers, and capacity limitations that hinder the adoption of flexible documentation frameworks.

This study aims to examine the impact of flexibility in working drawings and specifications on project performance in the Nigerian construction industry, with a focus on improving documentation practices to enhance quality, cost control, and time efficiency in construction delivery. While the objectives are to assess the current practices and limitations associated with the preparation and application of working drawings and specifications in Nigerian construction projects; identify the challenges caused by rigid or static documentation formats during the execution phase of construction; and evaluate the benefits of integrating flexibility into working drawings and specifications, particularly in terms of improving communication, cost management, and construction quality.

LITERATURE REVIEW

Concept of Flexibility in Construction Documentation

Leygonie, Motamedi, and Iordanova (2022) describe flexibility as a strategic design attribute that enhances collaboration, minimizes waste, and improves responsiveness. When applied to construction documentation,

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flexibility enables teams to make adjustments without extensive delays or confusion. In developed contexts, working drawings and specifications are no longer treated as final, fixed outputs. Instead, they are maintained as dynamic tools that evolve alongside project needs.

In the context of the Nigerian construction industry, where site conditions frequently change and regulatory procedures are often rigid, a lack of flexibility in documentation contributes to errors, disputes, and reduced construction quality (Owolabi et al.2024). Therefore, understanding how flexibility applies specifically to drawings and specifications is key to improving project performance across the country.

Role of Working Drawings and Specifications in Construction

Working drawings and specifications are fundamental tools for communication and coordination in any construction project (Alagbue et al.2024). Working drawings are graphical illustrations that describe the geometry, size, arrangement, and technical requirements of various building components. While the specifications complement these drawings by detailing materials, workmanship standards, installation methods, and compliance requirements (Emesiobi et al.2024; Adewumi et al.2025).

Therefore, these documents provide a shared reference point for architects, engineers, contractors, clients, and regulatory bodies. When properly integrated, they reduce ambiguity and support better coordination between disciplines (Owolabi et al,2024). However, when documentation is rigid, incomplete, or disconnected from site realities, construction teams may resort to verbal instructions or informal sketches, increasing the likelihood of error (Adewumi et al.2025).

In Nigeria, this disconnect is common. Many professionals produce drawings and specifications as separate documents, rarely revising them once a project progresses into the construction phase. (Alagbe et al.2024) observed that many projects rely on outdated specifications that no longer reflect the realities on site. In some cases, the lack of updates leads to procurement mismatches, regulatory non-compliance, or the need for on-site improvisation.

Global Best Practices and Nigerian Realities

International construction systems have embraced flexible design and documentation practices through early stakeholder collaboration, use of digital tools, and iterative project delivery models. Countries like South Korea and the United Kingdom utilize Building Information Modeling (BIM) and specification management platforms to create living documents. These documents evolve as project demands shift, allowing for continuous updates across architectural, structural, and services drawings (Leygonie et al., 2022).

Projects such as the Lagos Light Rail and the Second Niger Bridge illustrate this challenge. While certain adjustments were made to specifications during construction, these changes were often informal and lacked documentation traceability. Delays occurred partly due to the inability of project teams to revise working drawings efficiently or incorporate changes from site investigations (Emesiobi et al., 2024).

Digital Tools Supporting Documentation Flexibility

Digital transformation has enabled new levels of flexibility in construction documentation. Tools such as BIM, parametric modeling software, and automated specification platforms allow real-time collaboration and dynamic revision of project documents. Parametric design tools, in particular, use variable inputs to generate flexible geometries and technical details that adjust automatically to changes in requirements.

In Nigeria, however, adoption of such tools remains minimal. Most practitioners continue to use 2D drafting tools or paper-based processes. According to Alagbe et al. (2024), only a small number of professionals actively use BIM or parametric workflows. Factors limiting uptake include high software costs, lack of training programs, and poor internet access in some regions.

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Parametric Design and Digital Technologies

Parametric design is a digital design approach that uses algorithms and variable parameters to generate dynamic outputs. Unlike traditional static drawings, parametric models can be adjusted quickly by changing input values such as dimensions, materials, or performance criteria. This allows architects and engineers to produce flexible documentation that evolves in response to site conditions, client requirements, or regulatory constraints.

It is important to note that parametric design is one among several digital tools that facilitate flexibility in documentation. Building Information Modeling (BIM) enables multidisciplinary coordination and real-time updates across drawings and specifications, while Common Data Environments (CDEs) provide cloud-based platforms for version control and collaborative access. Together, these tools support an adaptive documentation ecosystem that enhances accuracy, reduces delays, and improves decision-making in construction projects.

Research Gap

While there is considerable literature on construction documentation in Nigeria, very few studies focus specifically on flexibility as a central factor influencing project performance. Most existing research emphasizes the completeness or technical accuracy of working drawings and specifications but rarely explores how rigid documentation impacts communication, coordination, or responsiveness during construction. There is also limited investigation into how global digital tools, such as BIM and automated specification platforms, can be adapted to Nigeria's construction context, especially for small to medium-scale projects. Furthermore, the role of regulatory systems in either enabling or restricting flexible documentation practices remains under-researched. Another overlooked area is the collaborative aspect of documentation, as most local studies frame it as the sole responsibility of architects rather than a shared task involving engineers, contractors, and clients. These gaps highlight the need for further research into flexible, integrated, and context-specific approaches to working drawings and specifications in the Nigerian construction industry.

METHODOLOGY

This study adopted a mixed-method approach, combining an extensive review of existing literature with the analysis of survey data collected from professionals in the Nigerian construction industry. The literature review covered academic journals, technical reports, and case studies published between 2020 and 2025, focusing on documentation practices, project performance, and the integration of digital technologies in construction. Special attention was given to documented Nigerian infrastructure projects, such as the Lagos Light Rail and the Second Niger Bridge, which provided context for understanding the real-world implications of rigid documentation practices.

The survey was designed to capture the perceptions and experiences of construction professionals from various disciplines, including architects, engineers, contractors, and surveyors, representing different types of firms and levels of experience. It explored key themes such as the flexibility of working drawings and specifications, the use of digital tools like Building Information Modeling (BIM), parametric design, digital fabrication, and virtual/augmented reality, as well as the perceived impact of these tools on project coordination and documentation quality.

The collected data were organized and analyzed thematically to identify patterns and insights related to current documentation practices and their limitations. This approach allowed the study to draw meaningful connections between existing literature and the field data, ensuring that the findings reflect both global best practices and the specific challenges faced in Nigeria. The methodology provided a foundation for critically examining how flexible documentation frameworks could enhance collaboration, improve accuracy, and support better project delivery in the Nigerian construction context.

The study involved a sample of 539 construction professionals who took part in the survey. This figure (N = 539) aligns with the demographic information provided in Chapter Four. Participants were sourced from various professional roles within the construction sector, including architects (32.1%), contractors (14.3%),

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engineers (11.3%), surveyors (14.1%), and other related fields. The variety of roles offers a well-rounded perspective on the perception and application of flexibility in working drawings and specifications within the industry. Additionally, secondary data sources such as journal articles, policy documents, and case studies were incorporated. The Lagos Light Rail and the Eko Tower projects were deliberately chosen as case studies, as they exemplify significant, high-profile developments in Lagos where challenges in documentation and the necessity for flexibility became particularly apparent. Their magnitude, intricacy, and prominence render them suitable benchmarks for assessing the effects of rigid versus adaptable documentation frameworks.

RESULTS AND DISCUSSION

Interpretation of Flexibility in Working Drawings

Flexibility in working drawings refers to the **ability of construction design documents to be adjusted, revised, or restructured** to reflect changing site conditions, client inputs, or evolving project requirements. In contemporary construction practice, especially in digitally enabled environments, flexibility is not viewed as a luxury, but as a **critical determinant of project success**. The responsiveness of working drawings can directly influence construction efficiency, quality assurance, and alignment between the design and execution phases (Leygonie et al., 2022).

Respondents' Perceptions of Flexibility

The results show that most professionals acknowledge the **flexibility advantages provided by parametric design tools**, especially in their ability to streamline modifications and enhance adaptability.

Table 1 respondents' perceptions of flexibility

S/N	Flexibility in Working Drawings	Level of Agreement using the Likert Scale					Total (Ef)	Efx	Mean Score (Efx/Ef)	Relative Index (RI)	Rank
		1	**2**	**3**	**4**	**5**					
1	Parametric design allows for easy modifications to working drawings.	64	82	160	133	100	539	1740	**3.228**	0.646	**1**
2	Working drawings can be quickly adjusted using parametric design tools.	76	87	98	179	99	539	1755	**3.256**	0.651	**2**
3	The flexibility offered by parametric design improves the design process.	69	73	152	127	118	539	1769	**3.282**	0.656	**7**
4	Parametric design enhances the adaptability of working drawings to changes.	75	66	115	137	146	539	1830	**3.395**	0.679	**6**
5	Working drawing created with parametric design are more adaptable to project needs.	76	65	155	137	106	539	1749	**3.245**	0.032	**6**

While the average mean scores hover around **3.2 to 3.4**, indicating moderate agreement, these responses highlight a **growing awareness** among Nigerian professionals regarding the benefits of flexible documentation

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systems. However, the **practical implementation** of such flexibility remains constrained by infrastructural and regulatory factors (Owolabi et al., 2024).

Accuracy and Precision in Working Drawings

Respondents linked digital fabrication with measurable **improvements in drawing precision**, echoing trends in advanced economies where these technologies are central to modern documentation workflows.

Table 2 Precision statement

S/N	Precision Statement	Mean Score	Relative Index (RI)	Rank
1	More accurate drawings	3.29	0.659	1
2	Improved drawing detail	3.21	0.642	2
3	Fewer errors in digitally generated drawings	3.29	0.659	7
4	Increased precision using digital tech	3.49	0.698	6
5	Enables exact specifications	3.29	0.659	6

This supports the argument in Alagbe et al. (2024) that **digital precision reduces rework, improves material estimation, and increases client satisfaction**, especially in complex builds like Eko Towers and Lagos Light Rail.

CONCLUSION AND RECOMMENDATIONS

This research explored how flexibility in working drawings and specifications affects the performance of construction projects in Nigeria. From everything reviewed, one thing is clear: many of the inefficiencies experienced during project execution are closely tied to how rigid and disconnected our documentation systems have become.

Most working drawings and specifications used in Nigerian construction today are prepared as static, isolated documents. Once completed and approved, they are rarely revisited or revised, even when unexpected changes happen on site. This creates confusion, forces site teams to improvise, and often leads to mistakes that could have been avoided. In fast-moving environments like Lagos, these issues become even more obvious. Professionals end up relying on verbal adjustments or hand-drawn revisions, which only widen the gap between design intent and actual construction.

Looking at how other countries manage documentation has shown that there are better approaches. In places like South Korea and the UK, drawings and specifications are treated as evolving documents that adjust to real-time needs. Digital tools like Building Information Modeling help teams stay in sync. While challenges still exist in those systems, they are better equipped to respond without derailing project flow or reducing quality.

In Nigeria, most construction teams are still working with traditional tools and methods. Although a few large projects have shown what is possible when documentation is kept flexible, these examples are still the exception. Some of the barriers include high software costs, limited training, and a regulatory environment that expects fixed, finalized documents. A shift in mindset is also necessary. There is still a strong belief that once a drawing is printed and signed, it should not change, even when conditions on the ground require it.Change will not happen all at once, but there are practical steps the industry can begin to take.

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Recommendations

- **Align drawings and specifications throughout the project:** These documents should be developed and revised together. Keeping them in sync prevents contradictions and supports better communication between all stakeholders.

- **Adopt digital tools, even if starting small:** Full BIM implementation may take time, but there are simpler collaborative tools that allow teams to track revisions, share updates, and manage documents more effectively.

- **Build skills through training and awareness:** Many professionals still lack exposure to modern documentation tools. Workshops, short training programs, and peer mentoring can help close this gap gradually.

- **Encourage early involvement from all parties**: Contractors, engineers, and consultants should be part of design discussions from the beginning. Their input helps reduce the need for major changes later in the process.

- **Update approval processes to allow controlled revisions**: Government agencies and planning authorities should consider phased submissions or version control systems. This would allow updates to be made without restarting the entire approval cycle.

Suggestions for Further Research

This study has made it clear that flexibility in construction documentation is not a luxury. It is essential for improving communication, reducing conflict, and delivering better project outcomes. When professionals are able to respond to change without being held back by outdated documents, they build with greater confidence and accuracy. With steady investment in tools, training, and collaboration, the Nigerian construction industry can begin to move toward a more adaptable and efficient future.

While this study has highlighted the value of flexibility in working drawings and specifications, further research is needed to deepen the understanding of its long-term impacts. Future studies could adopt longitudinal research methods to track projects that actively implement flexible documentation practices in Nigeria over time, assessing their effects on cost, quality, and project delivery. Additionally, deeper investigations into the regulatory reforms required to institutionalize flexible documentation, such as digital submission policies and adaptive approval frameworks, would provide valuable insights for policy and practice.

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