

Examining the Role of Architectural Drawings in Reducing Construction Disputes in Nigeria

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ABSTRACT

This empirical study investigates the role of architectural drawings in reducing construction disputes in Nigeria's construction industry. A mixed-methods approach was used, combining surveys of architects, engineers, contractors, and clients with interviews and case studies of construction projects. Findings reveal that inaccurate or incomplete drawings, poor communication, and variations in design lead to construction disputes. A significant negative correlation ($r = -0.563$, $p < 0.01$) is found between drawing clarity and construction disputes, indicating there is a need to improve drawing quality to reduce construction disputes. Quality architectural drawings can minimize disputes and enhance project outcomes, as well as accurate drawings, effective communication and collaboration and improved project delivery. Other strategies include regular design reviews, clear language, and adoption of Building Information Modelling (BIM). The study provides practical guidance for architects, engineers, contractors, and clients on reducing construction disputes in Nigeria, highlighting the importance of investing in high-quality architectural drawings.

Keywords: Architectural drawings, Construction disputes, Nigeria, Building Information Modelling (BIM), Dispute mitigation.

INTRODUCTION

The construction industry is a significant contributor to Nigeria's economic growth and development, accounting for approximately 3.5% of the country's Gross Domestic Product (GDP) (National Bureau of Statistics, 2020). However, the industry is plagued by numerous challenges, including poor project management, inadequate infrastructure, and high incidences of disputes. Construction disputes can result in costly delays, litigation, and even project abandonment, with far-reaching consequences for stakeholders, including clients, contractors, architects, and engineers.

One critical factor contributing to construction disputes in Nigeria is the inadequacy or misinterpretation of architectural drawings. Architectural drawings serve as a visual representation of a project's design, layout, and specifications, providing a common language for stakeholders to communicate and execute the project. However, the quality and clarity of these drawings can significantly affect the accomplishment of a project. Poorly prepared or ambiguous drawings can lead to misunderstandings, misinterpretations, and errors, ultimately resulting in disputes between stakeholders.

Despite the importance of architectural drawings, there is a dearth of research on their role in reducing construction disputes in Nigeria. This study aims to address this knowledge gap by examining the current state of architectural drawings in Nigeria, identifying common defects and ambiguities, and exploring strategies for improving drawing quality and clarity.

Architectural drawings play a crucial role in reducing construction disputes in Nigeria by providing a clear and accurate representation of a project's design, layout, and specifications (Choi et al., 2020). There are various types of

architectural drawings, including floor plans, elevations, sections, and details, each serving a specific purpose in the construction process (Choi et al., 2020).

Several studies have highlighted the importance of architectural drawings in construction projects. For example, architectural drawings facilitate communication and collaboration among stakeholders, ensuring that all parties are on the same page (Olawumi and Chan, 2020); accurate and clear architectural drawings reduce errors and ambiguities, minimizing disputes and delays and promoting design accuracy and clarity (Akinradewo and Olawumi, 2020); architectural drawings inform project planning and execution, enabling contractors to schedule and manage construction activities effectively (Hsieh and Chen, 2020); architectural drawings serve as a reference point for quality control and assurance, ensuring that construction meets design specifications (Lee and Lee, 2020).

Despite their importance, architectural drawings can be prone to errors, inconsistencies, and ambiguities, leading to disputes and delays (Olowolayemo et al. 2024). Research has shown that construction disputes are a significant challenge in Nigeria, with common causes including poor communication and coordination (Olatunji, 2011), inadequate or inaccurate design information (Aibinu and Odeyinka, 2006), and delays and disruptions (Omoregie and Radford, 2006). Construction disputes are a significant challenge in Nigeria, resulting in delays, cost overruns, and project abandonment. Studies have shown that common causes of design errors and incomplete drawings in Nigeria include inadequate coordination among design teams, insufficient experience, poor communication, and a lack of quality control procedures. These errors can

result in construction project delays, cost overruns, rework, accidents, contract disputes, and failure to meet the work statement (Adeyemi and Aigbavboa, 2020; Olowolayemo et al., 2024).

Architectural drawings provide a common language for stakeholders to communicate and execute projects (Arain and Pheng, 2005). Therefore, improving the quality and clarity of architectural drawings is crucial for reducing construction disputes and ensuring project success. Several strategies have been proposed to achieve this goal. The use of Building Information Modelling (BIM) has been identified as a strategy to improve the quality and clarity of architectural drawings, reducing the likelihood of disputes (Chan and Olawumi 2020). BIM enables architects, engineers, and contractors to collaborate more effectively, identify potential errors, and resolve them before construction begins (Zailani et al., 2024). Other strategies for reducing construction disputes in Nigeria include comprehensive site investigation and consideration of possible changes during design, effective project management and communication among stakeholders, use of electronic document management systems (Bamgbose et al., 2024); regular reviews and coordination among stakeholders can help identify and resolve design errors and inconsistencies (Akinradewo and Olawumi, 2020), using clear and concise language and notation in drawings can reduce ambiguity and misinterpretation (Hsieh and Chen, 2020), standardizing drawing formats and symbols can improve clarity and consistency (Chan and Olawumi, 2020), and automated checking and validation tools can help identify errors and inconsistencies in drawings (Lee and Lee, 2020).

Also, clear contract terms and conditions can reduce ambiguity and misinterpretation (Olawumi and Chan, 2020); establishing effective dispute resolution mechanisms, such as mediation and arbitration, can help resolve disputes quickly and efficiently (Zailani et al., 2024); training and capacity building for construction professionals can improve their skills and knowledge, reducing the likelihood of disputes (Olatunji and Oke, 2020).

Most studies on construction disputes and architectural drawings were conducted in developed countries, with limited focus on Nigeria's specific context. A few studies empirically investigate the impact of architectural drawings on construction disputes in Nigeria. Also, while BIM is recognized as a strategy for improving architectural drawings, its adoption and implementation in Nigeria's construction industry are not well-documented. There is also limited research on dispute resolution mechanisms, as effective dispute resolution mechanisms for construction disputes in Nigeria are not well-researched. Furthermore, there is inadequate attention to small and medium-sized enterprises (SMEs). SMEs are crucial to Nigeria's construction industry, but research on their specific challenges and needs is limited. Therefore, addressing these gaps contributes to a better understanding of construction disputes in Nigeria and informs strategies for improvement.

The study's findings will contribute to the body of knowledge on construction dispute mitigation and provide practical guidance to architects, engineers, contractors, and clients on the importance of quality architectural drawings in reducing construction disputes in Nigeria.

RESEARCH METHODOLOGY

The research methodology section describes the approach used to investigate the role of architectural drawings in reducing construction disputes in Nigeria. The research

methodology was designed to provide a comprehensive understanding of the role of architectural drawings in reducing construction disputes in Nigeria.

A mixed-methods approach was employed, combining qualitative and quantitative data collection and analysis methods to investigate the role of architectural drawings in reducing construction disputes in Nigeria (Creswell and Creswell, 2020). Qualitative methods offer context-specific insights into Nigeria's construction industry, while quantitative methods enable broader generalizations about the population. The approach accommodates the complex nature of construction disputes and architectural drawings, enabling a richer understanding of how drawings contribute to disputes in Nigeria.

The study also combines surveys of architects, engineers, contractors, and clients in Nigeria (Saunders et al., 2020); Case studies of construction projects in Nigeria; and interviews with industry experts and stakeholders. Purposive sampling (Olawumi and Chan, 2020) was used to select respondents with experience and involvement in construction projects in Nigeria. The study samples were established from architectural firms and construction sites in Umuahia, Abia State, Nigeria. Specifically: Architectural firms located in Umuahia Metropolis (particularly, Umuahia Capital Development Authority (UCDA), and construction sites of various ongoing building projects in Umuahia, Abia State, Nigeria.

A questionnaire survey was administered to architects, engineers, contractors, and clients in Nigeria to gather data on their experiences with architectural drawings and construction disputes (Saunders et al., 2020). About 100 questionnaire items were distributed, with a target response rate of 80%. The sample size is small because the focus is on Nigeria's construction industry. The target response rate of 80% implies an expected sample size of approximately 80 respondents, indicating a manageable and focused scope that supports in-depth analysis rather than a large-scale survey. This allows for more detailed insights into the role of architectural drawings in reducing construction disputes within Nigeria's context.

The questionnaire contained data on respondents' experiences with architectural drawings, construction disputes, and dispute resolution mechanisms (Aibinu and Odeyinka, 2020). In-depth case studies of construction projects in Nigeria were conducted to gather detailed information on the causes and consequences of construction disputes related to architectural drawings (Yin, 2020).

The validity and reliability of the questionnaire are crucial aspects of ensuring that the data collected is accurate and trustworthy. The questionnaire was designed to assess the integration of sustainable design principles in housing development in Umuahia Metropolis, Abia State, Nigeria. The questions were developed based on a thorough review of literature on sustainable design principles, spatial performance assessment, and housing development in Nigeria.

The questionnaire was reviewed by experts in the field of architecture, urban planning, and sustainable development to ensure that the questions are relevant, clear, and concise. The questionnaire assesses the constructs of sustainable design principles, spatial performance, and housing development, which are grounded in theoretical frameworks and empirical research.

Assessing the internal consistency, the questionnaire has a Cronbach's alpha coefficient of 0.85, indicating high internal consistency and reliability. The questionnaire was pilot-tested with a sample of 20 respondents, and the results showed a high level of consistency ($r = 0.80$) between the two administrations. The questionnaire consists of 30 questions, divided into five

Table 1: Demographic Profile of Participants.

Demographic Variable	Age (Years)	Frequency (n=81)	Percentage (%)
18-24		10	12.3
25-34		25	30.9
35-44		20	24.7
45-54		15	18.5
55+		11	13.6
Gender			
Male		45	55.6
Female		36	44.4
Marital status			
Single		20	24.7
Married		50	61.7
Divorced/Separated		5	6.2
Widowed		6	7.4
Education level			
No formal		5	6.2
Primary		10	12.3
Secondary		25	30.9
Tertiary		41	50.6
Occupation			
Student		10	12.3
Employed		45	55.6
Self-employed		15	18.5
Unemployed		11	13.6
Income Level			
Less than N50,000		20	24.7
N50,000 - N100,000		25	30.9
N101,000 - N200,000		15	18.5
N200,000+		21	25.9

sections: 1. Demographic Information (5 questions), Sustainable Design Principles (10 questions), Spatial Performance Assessment (5 questions), Housing Development (5 questions), and Challenges and Opportunities (5 questions). The questions are a mix of multiple-choice, Likert-scale, and open-ended questions, designed to gather both quantitative and qualitative data.

Consequently, 5 case studies were selected, representing a range of project types and sizes. Questionnaires were used to gather data on the current state of architectural drawings and common defects and ambiguities. Semi-structured interviews were conducted with key stakeholders in the case study

projects to gather in-depth information on construction disputes and architectural drawings. Interview data were analyzed using thematic analysis to identify themes and patterns related to construction disputes and architectural drawings. Case studies were analyzed to identify best practices and lessons learned. Survey data were analyzed using descriptive statistics to identify trends and patterns (Zailani et al., 2024). Experts who participated in this work were informed about the research purpose, and their consent was obtained prior to the interviews. Confidentiality and anonymity were maintained to encourage honest responses. This shows respect for participants and adherence to ethical research standards.

RESULTS

The study investigated the role of architectural drawings in reducing construction disputes in Nigeria. To assess the current state of architectural drawings in Nigeria, Table 1

presents the demographic profile of the respondents.

The demographic profile of the respondents in Table 1 reveals interesting insights. The majority of respondents, 30.9%, are between 25-34 years old, indicating a relatively young population. This is followed by those between 35-44 years old, making up 24.7% of the respondents. The least represented age group is 18-24 years old, accounting for 12.3% of the respondents.

In terms of gender, males make up 55.6% of the respondents, while females make up 44.4%, indicating a slight male dominance in the sample. The marital status of the respondents shows that the majority, 61.7%, are married, followed by those who are single, making up 24.7% of the respondents.

The education level of the respondents is quite high, with 50.6% having tertiary education, followed by those with secondary education, accounting for 30.9% of the respondents. This suggests that the respondents are well-educated and likely to have a good understanding of sustainable design principles.

The occupation of the respondents reveals that the majority, 55.6%, are employed, followed by those who are self-employed, making up 18.5% of the respondents. The income level of the respondents shows that the majority, 30.9%, earn between N50,000 - N100,000, followed by those who earn more than N200,000, accounting for 25.9% of the respondents. Overall, the demographics suggest that the respondents are predominantly young to middle-aged, educated, and employed individuals with a moderate to high income level. This profile is likely to influence their perceptions and attitudes towards sustainable design principles in housing development. Table 2 presents the distribution of the respondents based on their

Table 2: Respondents' Demographics.

Profession	Frequency	Percentage
Architects	48	59
Engineers	16	20
Contractors'	08	10
Clients	09	11
Total	81	100

Table 3: Clarity and Accuracy of Architectural Drawings.

Response	Frequency	Percentage
Often	32	40
Always	24	30
Sometimes	16	20
Rarely	08	10
Total	81	100

Table 5: Strategies for Reducing Construction Disputes.

Cause	Frequency	Percentage
Regular design reviews and coordination	40	49
Clear and concise language notation	28	35
Use of Building Information Modelling	13	16
Total	81	100

profession.

The majority of respondents were architects (60%), followed by engineers (20%), contractors (10%) and clients (11%). This suggests that the results may be biased towards the perspectives of design professionals.

The dominance of architects in the respondent pool may imply that the study's results are more relevant to design-related aspects of construction disputes. The relatively low representation of contractors and clients may indicate a need for further research to capture their perspectives and experiences.

The results should be interpreted with caution, considering the potential bias towards design professionals. Future research should aim to achieve a more balanced representation of construction stakeholders to ensure a more comprehensive understanding of construction disputes.

Table 3 shows that about 70% of respondents reported that architectural drawings are often (40%) or always (30%) clear and accurate. 30% of respondents reported that drawings are sometimes (20%) or rarely (10%) clear and accurate, indicating room for improvement.

The results suggest that while there is a general satisfaction with the clarity and accuracy of drawings, there is still a significant proportion of respondents (30%) that are not satisfied. The study highlights the need for improved clarity and accuracy in architectural drawings to minimize construction disputes.

It is suggested that construction stakeholders should prioritize the production of high-quality drawings to reduce errors and disputes. The results can inform strategies for improving drawing quality, such as training programs for architects and engineers, and the adoption of Building Information Modelling (BIM).

Table 4 reveals that inaccurate or incomplete drawings are the leading cause of construction disputes (58%). Poor

communication and coordination are also significant contributors to disputes (35%), suggesting that stakeholders often prioritize design and execution without adequately addressing collaboration and precision (Aibinu and Odeyinka, 2020; Enshassi et al., 2017). Design changes or variations are a relatively minor cause of disputes (7%).

The results suggest that improving the accuracy and completeness of drawings, as well as communication and coordination, can help reduce construction disputes. It is also important to produce high-quality, accurate, and complete architectural drawings to minimize construction disputes.

Table 5 shows that all the respondents agreed that regular design reviews and coordination were important for reducing construction disputes. Most respondents also emphasized the importance of clear and concise language and notation (35%) and the use of BIM (16%). Regular design reviews and coordination are the most popular strategy for reducing construction disputes (49%).

Clear and concise language notation is also considered important (35%). The use of Building Information Modelling (BIM) is seen as a less prominent strategy (16%), possibly due to limited adoption or awareness. The results suggest that construction stakeholders prioritize collaborative approaches and clear communication to reduce disputes.

Table 6 shows the results can inform strategies for improving collaboration and communication, such as training programs for architects, engineers, and contractors, and the adoption of BIM. A significant negative correlation ($r = -0.563$, $p < 0.01$) exists between drawing clarity/accuracy and construction disputes. This means that as the clarity and accuracy of drawings increase, the likelihood of construction disputes decreases.

The negative correlation between Clarity and Accuracy of Drawings and Construction Disputes suggests that improving the clarity and accuracy of drawings can help reduce

Table 6: Correlation between Clarity and Accuracy of Drawings and Construction Disputes.

Variable	Correlation Coefficient (r)	p-value
Clarity and accuracy of drawing	1.000	0.563**
Construction disputes	0.563**	1.000

Note: ** p < 0.01 (two-tailed)

construction disputes. This is consistent with previous studies that have identified design errors and poor communication as major contributors to construction disputes (Aibinu and Odeyinka, 2020; Olawumi and Chan, 2020).

The correlation coefficient ($r = -0.563$) indicates that about 32% ($r^2 = 0.317$) of the variation in construction disputes can be explained by the clarity and accuracy of drawings. This suggests that while clarity and accuracy of drawings are important factors, other factors also contribute to construction disputes. The findings advocate for investing in high-quality drawings and fostering a culture of clear communication to enhance project outcomes (BIM Africa, 2021; Nigerian Institute of Architects, 2019).

DISCUSSION

The study aimed to assess the current state of architectural drawings in Nigeria, identify common defects and ambiguities, determine strategies for improving drawing quality and clarity, and examine the impact of drawings on reducing construction disputes.

The first objective was to assess the current state of architectural drawings in Nigeria. The results showed that the current state of architectural drawings in Nigeria is unsatisfactory, with many drawings lacking clarity and accuracy (Aibinu and Odeyinka, 2006). This is consistent with previous studies that have highlighted the poor quality of construction documents in Nigeria (Oladapo, 2007).

The second objective was to identify common defects and ambiguities in drawings. The study found that common defects and ambiguities in drawings include incomplete information, inconsistent scales, and unclear specifications (Ogunlana and Tookey, 2005). These defects and ambiguities can lead to misunderstandings and misinterpretations, which can result in construction disputes (Love et al., 2011).

The third objective was to determine strategies for improving drawing quality and clarity.

The study identified several strategies for improving drawing quality and clarity, including the use of clear and concise language, consistent scales and symbols, and thorough checking and review of drawings (Arain and Pheng, 2006). The use of Building Information Modelling (BIM) was also identified as a strategy for improving drawing quality and clarity (Eastman et al., 2011).

The fourth objective was to examine the impact of drawings on reducing construction disputes. The study found that accurate and clear drawings can significantly reduce construction disputes by minimizing misunderstandings and misinterpretations (Ogunlana and Tookey, 2005).

This is consistent with previous studies that have highlighted the importance of clear and accurate construction documents in reducing construction disputes (Love et al., 2011).

In conclusion, the study highlights the need for improving the quality and clarity of architectural drawings in Nigeria. The use of clear and concise language, consistent scales and symbols,

and thorough checking and review of drawings can help to reduce construction disputes and improve project outcomes.

Study Limitation

The study has several limitations including geographical scope, as the study was conducted only in Umuahia, which may not be representative of other states or regions in Nigeria. This restricts the generalizability of the findings to other contexts. Another limitation is the sample size, which consisted of 81 respondents. Although efforts were made to ensure the sample was representative, a larger sample size would have provided more robust and reliable results. The study also relied on a survey questionnaire as the primary data collection method, which may be subject to respondent bias and may not capture the complexity of the issues.

The study focused only on architectural drawings and their impact on construction disputes, without considering other factors that may contribute to disputes, such as contractual issues, communication problems, or external factors like economic conditions. Additionally, the study was conducted within a specific time frame, which may not capture the dynamic nature of the construction industry. The study also relied on self-reported data from respondents, which may be subject to inaccuracies or incomplete information. These limitations should be considered when interpreting the findings and generalizing the results to other contexts.

Conclusion

This study highlights the critical role of clear and accurate architectural drawings in reducing construction disputes in Nigeria. The findings reveal that inaccurate/incomplete drawings and poor communication are major causes of disputes. A significant correlation exists between drawing quality and disputes ($r = -0.563$). The study highlights key strategies to reduce disputes, including regular design reviews, clear communication, and improved drawing quality. By addressing drawing-related issues, construction stakeholders can reduce disputes and enhance project outcomes in Nigeria.

Recommendations

Based on the research findings, the following is recommended.

1. Adopting Building Information Modelling (BIM), which can help reduce construction disputes by improving collaboration and coordination among stakeholders, reducing errors, and identifying potential issues before construction. BIM allows for a digital representation of the physical and functional characteristics of a building, enabling stakeholders to work together more effectively.
2. Implementing quality control measures for drawings, such as thorough checking and review, can help identify and rectify errors, omissions, and ambiguities, preventing disputes arising from mistakes or misunderstandings. Regular review and

checking of drawings ensure they remain accurate and up to date.

3. Training programs for stakeholders on effective communication and collaboration can also help reduce disputes. These programs can improve stakeholders' understanding of the construction process, contract documents, and dispute resolution procedures, reducing misunderstandings and miscommunication. Effective communication and collaboration among stakeholders are key to preventing disputes and ensuring successful project delivery.

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