INFLUENCE OF QUALITY ASSURANCE MECHANISMS IN MITIGATING BUILDING COLLAPSE INCIDENCES IN EDO STATE

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BENIN CITY

NOVEMBER, 2025

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF QUANTITY SURVEYING, FACULTY OF ENVIRONMENTAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, NIGERIA. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (B.SC.) IN QUANTITY SURVEYING

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DECLARATION

I declare that this project is an original work carried out by me, **Emmanuel Chukwuemeka Igheghe** with Matriculation Number **ENV2002807** in the Department of Quantity Surveying, Faculty of Environmental Sciences, University of Benin, Benin City.

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CERTIFICATION

We certify that this project with the title: **Influence of Quality Assurance Mechanisms in Mitigating Building Collapse incidences in Edo State** submitted by **Emmanuel Chukwuemeka Igheghe**, with Matriculation Number **ENV2002807** has satisfied the regulations governing the award of Bachelor's Degree in Quantity Surveying from the University of Benin, Benin City, Edo State.

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DEDICATION

This project is dedicated to God Almighty, the source of wisdom, time, talent, resources, and all blessings. I am deeply grateful for His guidance, inspiration, and unwavering support throughout my years of study in this esteemed institution.

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ABSTRACT

Building collapse remains a persistent challenge in Nigeria's construction industry, resulting in significant loss of lives, injuries, and economic setbacks. Despite the existence of regulatory frameworks such as the Nigerian Building Code and the activities of monitoring agencies, incidences of structural failure continue to occur. In Edo State, although regulatory compliance efforts have shown improvements in recent years, isolated collapse events such as the 2024 three-storey building failure in Benin City highlight the need for a critical evaluation of the effectiveness of quality assurance mechanisms. This study investigated the influence of quality assurance mechanisms in mitigating building collapse incidences in Benin City, Edo State, Nigeria. Specifically, the study examined the quality assurance mechanisms available for collapse prevention, identified the factors influencing their effectiveness, and assessed their overall level of effectiveness. A quantitative survey research design was adopted, and data were collected using structured questionnaires administered to 268 construction professionals, of which 200 were validly completed and returned, representing an 84% response rate. Descriptive statistics and the Mean Item Score (MIS) technique were used to analyze the data. The findings revealed that a broad range of quality assurance mechanisms are considered essential in mitigating collapse, with Quality Control Plans and Checklists (MIS = 4.10) and Defect Liability Period and Snagging (MIS = 4.09) ranked highest. Supply-chain challenges, weak regulatory enforcement, economic constraints, and poor procurement practices were identified as the most critical factors influencing QA effectiveness. The assessment of QA performance further showed that Continuous Monitoring and Feedback Loops (MIS = 4.54) and Mock-ups/Prototype Works (MIS = 4.53) were perceived as the most effective tools for collapse prevention. The study concludes that preventing building collapse requires an integrated and multi-layered quality assurance framework supported by strong regulatory enforcement, improved material control, enhanced professional supervision, and capacity development. It recommends strengthening regulatory institutions, adopting digital QA tools, improving supply-chain transparency, and implementing continuous professional training to enhance construction quality and safeguard public safety in Edo State.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The construction industry serves as a cornerstone of societal development, playing a pivotal role in the provision of essential infrastructure, including residential, commercial, and public buildings (Afolabi, 2017). A building, broadly defined as a structure or enclosure constructed from materials such as bricks, sand, cement, and concrete, serves the fundamental purpose of providing shelter and security, while also fulfilling various societal needs such as living space, privacy, and storage (Oloyede, 2015). However, the global phenomenon of building collapses poses a significant threat to this crucial sector, resulting in devastating consequences that include loss of life, injuries, economic instability, and social disruption (Nwokoro, 2018). On average, approximately eight building collapses occur worldwide each year, leading to over 300 fatalities, underscoring the severity of this issue on a global scale (International Association for Bridge and Structural Engineering, 2020).

In the Nigerian context, building collapse has become a significant and recurring problem, with numerous incidents reported across the nation (Adeyemi, 2019). The frequency and severity of these events have been on an alarming upward trend in recent years, causing considerable concern among stakeholders, including government agencies, construction professionals, and the general public (Olagunju, 2020). Statistical data reveals the magnitude of this crisis. Between 1973 and 2022, Nigeria recorded 177 reported cases of building collapse, resulting in the tragic loss of 956 lives (Nigerian Institute of Building, 2022). Another study indicated that from 1981 to 2021, 199 building collapse cases occurred, leading to 1072 deaths and 387 injuries (Afolabi, 2021). More recent data from the Building Collapse Prevention Guild (BCPG) shows a disturbing trend, with 47 building collapses recorded across 14 states in 2024 alone (Building Collapse Prevention Guild,(BCPG) 2024). This brings the total recorded building collapses in Nigeria to 640 between October 1974 and January 2025, with a staggering 1,595 deaths (BCPG,2025).

The South-South region of Nigeria, and specifically Edo State, the issue of building collapse, while perhaps not as prevalent as in some other states like Lagos, still presents a cause for concern (Edo State Government, 2022). While one report indicated that Edo State was the only state in the South-South geopolitical zone with zero building collapses in 2022, attributing this to strict adherence to building regulations (Edo State Government, 2022), this positive development appears to have been temporary. In September 2024, a three-storey building housing students near the University of Benin in Benin City, Edo State, collapsed, although fortunately, no fatalities were recorded (Vanguard, 2024). This incident underscores the continued vulnerability of the built environment in the state to structural failures. National statistics further support this, with Edo State recording one building collapse in 2024 (BCPG,2024).

In response to the persistent challenge of building collapses, the concept of quality assurance (QA) has gained prominence in the construction industry (Olagunju, 2020). Quality assurance refers to the systematic processes and procedures implemented to ensure that all construction activities meet specified standards and regulations throughout the project lifecycle (International Organization for Standardization, 2015). It is a proactive approach that focuses on preventing defects and enhancing the overall quality of construction projects by establishing clear guidelines, documentation, and checks (Adeyemi, 2019). Effective implementation of quality assurance mechanisms holds the potential to significantly mitigate the occurrence of building collapse incidences by ensuring adherence to proper design, material quality, and construction practices (Nwokoro, 2018).

Quality assurance (QA) in the realm of construction encompasses the systematic and pre-planned activities that are implemented to ensure that a construction project adheres to the required specifications and standards as detailed in the project documentation (International Organization for Standardization, 2015). The essence of QA lies in establishing robust processes and meticulously developing plans that serve to verify the correct execution of construction activities, ultimately guaranteeing that the final product achieves the intended level of quality.

While the terms are frequently used interchangeably, quality assurance (QA) and quality control (QC) represent distinct yet complementary facets of quality management within the construction sector (Nwokoro, 2018). QA adopts a proactive stance, concentrating on the prevention of defects by establishing and diligently maintaining standards and procedures throughout the entire lifecycle of a construction project.

Quality assurance mechanisms in the construction industry include systematic approaches such as quality control plans, inspections and testing, quality management systems, ISO 9001 certification, third-party audits, material inspection and testing, workmanship standards, design review, construction supervision, defect liability period, snagging, quality assurance checklists, training and certification, continuous improvement, document management systems, non-conformance reporting, adherence to building codes and regulatory standards, application of technology and risk assessment and mitigation, all of which help ensure projects meet specified requirements, client expectations, and regulatory standards

Several core principles form the bedrock of quality assurance, guiding construction projects toward the achievement of optimal quality outcomes that not only meet but also exceed the project's requirements and the expectations of stakeholders (Olagunju, 2020). Among the most fundamental of these principles are "Fit for Purpose" and "Right First Time" (Afolabi, 2021).

In construction quality assurance, "fit for purpose" means a completed project or component meets its intended use and specifications, ensuring it functions as required and complies with relevant standards. "Right first time" emphasizes eliminating all defects and errors to avoid rework, saving time and cost, and improving efficiency

The absence of robust quality assurance in construction projects can lead to a cascade of negative consequences that significantly impact project success across multiple dimensions (Nwokoro, 2018). Poor quality inevitably results in a waste of valuable time, resources, and materials, directly eroding project budgets (Adeyemi, 2019).

The Nigerian construction industry faces significant challenges in ensuring quality assurance, which is crucial for the sector's growth and development. Various factors influence the implementation and effectiveness of quality assurance mechanisms in the industry. This essay summarizes the key factors that impact quality assurance in the Nigerian construction industry.

Economic factors play a significant role in shaping the approach to quality assurance. The cost implications of quality assurance can be substantial, and in an environment where economic pressures are high, there may be a temptation to compromise on quality (Adeyemi, 2019). However, effective quality assurance can lead to significant cost savings and improved efficiency throughout the project lifecycle (Olagunju, 2020). Studies have shown that the cost of rework alone can average around 5% of the total project cost, highlighting the importance of implementing robust quality assurance measures (Nwokoro, 2018).

Regulatory and legal factors are also critical in shaping the quality assurance landscape. The National Building Code and regulatory bodies such as the Standards Organisation of Nigeria (SON) and the Council for the Regulation of Engineering in Nigeria (COREN) play a crucial role in establishing quality standards and ensuring compliance (Federal Republic of Nigeria, 2017). The legal framework imposes liabilities and penalties for poor quality and building failures, serving as a significant driver for construction firms to prioritize quality assurance (Afolabi, 2021).

Client demands and expectations are increasingly driving the need for quality assurance. Clients are becoming more aware of quality standards and the potential consequences of poor construction, and they are demanding higher levels of quality in their projects (Olagunju, 2020). Construction firms that prioritize client satisfaction through effective quality assurance are more likely to build long-term relationships and enhance their competitive advantage (Adeyemi, 2019).

Technological advancements, such as Building Information Modelling (BIM) and digital quality control tools, have the potential to revolutionize quality assurance in the construction industry (Afolabi, 2021). These technologies can enhance the efficiency, accuracy, and overall effectiveness of quality assurance processes, reducing human error and improving collaboration among project stakeholders (Nwokoro, 2018).

The availability of skilled labor and training programs also has a profound impact on the effectiveness of quality assurance mechanisms. The industry faces a significant shortage of skilled craftsmen and technicians, which directly affects the quality of workmanship and the ability to meet required standards (Adeyemi, 2019). Investing in training programs that focus on modern construction techniques, safety protocols, and quality control procedures can significantly improve the quality of work and the overall outcomes of construction projects (Olagunju, 2020).

Finally, organizational culture and management commitment are pivotal factors influencing the prioritization and effective implementation of quality assurance mechanisms. A strong quality culture, nurtured and promoted by leadership, is fundamental to achieving high standards in construction projects (Nwokoro, 2018). Top management commitment is crucial for providing the necessary resources, setting clear expectations, and fostering an environment that prioritizes quality throughout the project lifecycle (Afolabi, 2021).

In conclusion, the effective implementation of quality assurance mechanisms in the Nigerian construction industry is influenced by a complex interplay of economic, regulatory, client-related, technological, labor-related, and organizational factors. Addressing these factors is crucial for improving the quality of construction projects and ensuring the growth and development of the industry. By prioritizing quality assurance, construction firms can enhance their competitiveness, build long-term relationships with clients, and contribute to the development of a safer and more sustainable built environment.

1.2 Statement of the Research Problem

Despite the existence of building codes and regulations in Nigeria, including Edo State, the persistent problem of building collapses, particularly in Benin City, Edo State, remains a critical concern. These collapses result in significant human and economic costs. The loss of lives and the injuries sustained leave lasting emotional scars on families and communities. Economically, these incidents lead to the wastage of resources, loss of investments, and disruption of livelihoods.

The continued occurrence of building collapses despite regulatory frameworks suggests potential challenges in the implementation and enforcement of these codes. Factors such as weak enforcement, non-compliance by developers and contractors, and potential corruption within regulatory agencies may contribute to this gap. While quality assurance mechanisms are recognized as a vital tool for preventing construction defects, there is still lack of comprehensive research specifically investigating the direct influence of these mechanisms in mitigating building collapse incidences within the specific context of Edo State. Therefore, this study seeks to address this gap by exploring the relationship between the implementation of quality assurance mechanisms and the occurrence of building collapses in Benin City, Edo State.

The construction industry serves as a cornerstone for the socio-economic progress of any nation, playing a vital role in infrastructure development, job creation, and overall economic growth (Afolabi, 2017). The quality of the output from this sector directly impacts public safety, the longevity of infrastructure, and the financial stability of both organizations and governments (Olagunju, 2020). In an increasingly globalized world, the emphasis on achieving and maintaining high standards of quality in construction has intensified, with stakeholders demanding built environments that are not only functional and aesthetically pleasing but also safe, durable, and cost-effective (International Organization for Standardization, 2015).

While the pursuit of quality in construction is a worldwide concern, developing economies like Nigeria face unique and significant challenges in this regard (Adeyemi, 2019). The Nigerian construction industry has been plagued by persistent issues such as structural defects, the use of substandard materials, and instances of poor workmanship (Nwokoro, 2018). These deficiencies have regrettably led to frequent building failures, posing severe safety hazards to the public and resulting in substantial economic losses for individuals, businesses, and the nation as a whole (Afolabi, 2021).

Given this context, there is a pressing need for a comprehensive understanding of the influence of quality assurance and the various mechanisms that can be employed to enhance the quality of construction projects within the Nigerian context. This research paper aims to address this need by providing a thorough exploration of quality assurance in the construction industry, with a specific focus on Edo State, Benin City.

1.3 Research Questions

This study aims to answer the following research questions:

1. What quality assurance mechanisms are available for mitigating building collapse incidences in Edo state?
2. What are the factors influencing quality assurance mechanisms in mitigating building collapse incidences in the study area?
3. What is the level of effectiveness of quality assurance mechanism for mitigating building collapse incidences in the study area?

1.4 Aim and Objectives of the Study

The overarching aim of this study is to assess the effectiveness of quality assurance mechanisms on incidences of building collapse in Edo State, Nigeria, with a view to mitigating future occurrences.

To achieve this aim, the following specific objectives will be pursued:

The objectives of the study are to;

1. Examine the quality assurance mechanisms available for mitigating building collapse incidences in Edo State.
2. Investigate the factors influencing the effectiveness of quality assurance mechanisms in mitigating building collapse incidences in the study area.
3. Assess the level of effectiveness of quality assurance mechanisms for mitigating building collapse incidences in the study area.

1.5 Scope of the Study

The geographical scope of this study is specifically limited to Benin City, the capital of Edo State, Nigeria. This focus allows for an in-depth examination of the local context, including the specific regulatory environment, construction practices, and documented incidences of building collapses within this urban center. The scope of the study will cover the last decade, from 2014 to 2024. This timeframe is chosen to capture recent trends and patterns in building collapses and the potential influence of contemporary quality assurance practices and regulatory enforcement efforts within this period.

The target population for this study includes key stakeholders in the construction industry and regulatory framework within Benin City. These comprise registered Architects, Civil/Structural Engineers, Builders/Contractors, Quantity Surveyors, Estate Developers, and Land Surveyors, who are directly involved in building design, construction, and supervision. In addition, the study will also focus on the Edo State Development and Building Control Agency, which plays a critical role in monitoring, enforcing, and ensuring compliance with building regulations and quality assurance mechanisms.

1.6 Significance of the Study

This study holds significant potential to contribute to various aspects of the construction industry and public safety in Benin City, Edo State. For the construction industry, the findings will provide valuable insights into the effectiveness of current quality assurance practices and identify areas for improvement. This could lead to the adoption of more robust QA mechanisms, ultimately enhancing the quality and safety of construction projects. For policymakers, this research will offer evidence-based recommendations for strengthening building regulations, improving enforcement strategies, and potentially developing targeted interventions to address the specific factors contributing to building collapses in the region. Most importantly, this study is significant for public safety. By investigating the influence of quality assurance on mitigating building collapses, the research aims to contribute to the development of strategies that can save lives, prevent injuries, and reduce the economic and social costs associated with these tragic events in Benin City. Furthermore, this study will contribute to the academic body of knowledge by providing empirical evidence on the relationship between quality assurance and building collapse in a specific regional context within Nigeria, which can inform future research in this critical area.

1.7 Limitations of the Study

One of the limitations of this study is its reliance on self-reported data from construction professionals, which may be influenced by response bias or underreporting of unethical practices such as corruption or non-compliance. Additionally, the study is geographically restricted to Edo State, limiting the generalizability of its findings to other regions with different regulatory environments and socio-economic conditions. The quantitative design, while effective in identifying key factors, does not capture deeper contextual nuances or lived experiences that qualitative methods might reveal. Finally, the study focuses primarily on formal-sector practitioners, potentially overlooking the substantial influence of informal construction actors who play a major role in building delivery in Nigeria.

1.8 **Definition of Terms**

Quality Assurance Mechanisms**:** For the purpose of this study, quality assurance mechanisms are defined as the planned and systematic activities implemented within the construction industry to provide confidence that buildings and construction processes will fulfill specified requirements and standards. These mechanisms encompass a range of proactive measures aimed at preventing defects in design, materials, and workmanship throughout the project lifecycle.

Building Collapse**:** In the context of this research, building collapse refers to the partial or total structural failure of a building, resulting in its sudden and often catastrophic fall or cave-in. This failure renders the building unfit for its intended use and can lead to significant damage, injuries, and loss of life.

Building Codes: These are defined as a set of regulations and standards established by governmental authorities to ensure the safety and quality of buildings. They provide minimum requirements for design, construction, materials, and maintenance to safeguard public health and safety.

Regulatory Framework: This term refers to the system of laws, regulations, guidelines, and administrative bodies that govern the construction industry in Edo State, including the processes for obtaining permits, ensuring compliance with building codes, and enforcing quality standards

CHAPTER TWO

LITERATURE REVIEW

2.1 Preamble

Construction Quality Assurance (QA) represents a fundamental pillar in the pursuit of safe and durable built environments (Sablono, 2024). It is understood as a systematic and proactive methodology focused on the prevention of defects and the optimization of processes throughout the entire lifecycle of a construction project. This encompassing approach necessitates the establishment of a robust quality management system, which integrates policies, meticulously defined procedures, and clearly articulated standards to guide every phase of a project, from its initial planning stages to its final completion (Sablono, 2024)

2.2 Quality Assurance Mechanism in Construction Industry

The overarching aim of QA is to ensure that all construction processes are executed with both accuracy and efficiency, thereby consistently meeting the expectations of the client and adhering to the rigorous standards set by the industry. Quality assurance (QA) refers to the systematic and planned activities implemented to ensure that a construction project meets the required specifications and standards (International Organization for Standardization, 2015). QA mechanisms are essential in the construction industry, as they help to prevent defects, errors, and deviations from established quality standards (Adeyemi, 2019). The importance of QA mechanisms cannot be overstated, as they ensure that construction projects are executed in accordance with established standards and specifications, reducing the likelihood of defects and errors (Cheung et al, 2019).

At its core, QA adopts a process-centric perspective, placing a strong emphasis on preventing defects from occurring in the first instance, rather than merely detecting and rectifying them after they have materialized (Sablono, 2024). This proactive stance involves the careful establishment of standards and protocols that must be rigorously followed throughout the project's progression to effectively avoid any deviations that could potentially lead to defects or, in more severe cases, structural failures. Furthermore, a central tenet of QA is the continuous evaluation and improvement of existing processes (Sablono, 2024). This iterative approach allows for the refinement of methodologies and the incorporation of lessons learned to enhance the overall quality of future projects (Sablono, 2024)

Several key principles underpin the philosophy of QA in construction. These include the concept of "Fit for Purpose," which underscores the importance of selecting materials and construction techniques that are entirely suitable for their intended function within the building. Another critical principle is "Right First Time," which emphasizes the need for detailed and thoughtful planning at every stage of the project to anticipate and mitigate potential issues before they emerge, alongside ensuring that all personnel possess the necessary skills, training, and resources to perform their tasks correctly from the outset. Continuous monitoring and the implementation of feedback mechanisms are also integral to QA principles, allowing for the early detection of any deviations from established standards and the prompt implementation of corrective actions. (Sablono, 2024)

Quality assurance focuses on implementing systematic activities to ensure that project requirements are consistently met throughout the entire project lifecycle (Arditi & Gunaydin, 2019). This involves the application of rigorous inspection protocols, the conduct of thorough compliance audits, and the execution of systematic reviews of both the design and construction processes (Anvuur & Ngowi, 2020). Modern approaches to quality management in construction have evolved significantly, moving away from a primary focus on final product inspection to detect defects towards proactive quality management strategies that integrate quality planning, assurance, and control into every phase of a project (Love et al, 2018). This shift reflects a broader understanding that quality must be inherently built into the processes of construction rather than merely inspected after the fact (Makul, 2019)

The phenomenon of building collapse has been a major global concern, especially in developing countries, where rapid urbanization often outpaces regulatory frameworks (Oloyede, 2015). A building collapse is the sudden structural failure of a building or part of it, rendering it unsafe for human habitation or use (Nwokoro, 2018). Such failures result in casualties, economic losses, and loss of confidence in the construction industry (Afolabi, 2017).

The Nigerian construction sector, including Edo State, is faced with recurring building collapse incidences. Studies have shown that between 1973 and 2025, over 600 cases of collapse were reported nationwide, with over 1,500 deaths (BCPG, 2025). These alarming statistics highlight the need for sustainable solutions.

QA is one such solution. The International Organization for Standardization (2015) defines QA as a systematic process of ensuring that construction activities and outputs comply with specified requirements. Unlike quality control, which detects faults after construction, QA is proactive, focusing on prevention of defects (Nwokoro, 2018).

The construction industry applies QA to ensure compliance with design specifications, material standards, and workmanship practices. This is particularly vital in Nigeria, where lapses in design review, material testing, and supervision are recurring triggers of collapse (Adeyemi, 2019).

2.3 Distinguishing Quality Assurance from Quality control

While the terms 'Quality Assurance' (QA) and 'Quality Control' (QC) are frequently used in discussions about quality in construction, they represent distinct yet complementary aspects of quality management (Paredes, 2024). It is crucial to differentiate between these two concepts to fully appreciate their respective roles in ensuring the integrity and safety of building projects (Paredes, 2024).

Quality Assurance (QA) is fundamentally a proactive process that focuses on preventing defects before they occur. It is process-oriented, meaning it emphasizes the establishment and maintenance of effective processes and systems to ensure that the work is done right the first time. QA provides the framework, defining the methods and specifying the standards that need to be followed throughout the project lifecycle. In essence, QA aims to build quality into the project from its inception by focusing on planning, documentation, and the establishment of robust procedures (Sablono, 2024).

On the other hand, Quality Control (QC) is a reactive process that is primarily concerned with identifying and correcting defects in the finished product or during specific stages of construction. It is product-oriented, focusing on verifying whether the final deliverable meets the specified quality standards through inspection and testing (Paredes, 2024). QC involves tangible actions such as conducting strength tests on materials like concrete, checking the dimensions of structural elements, and performing regular site inspections to identify and rectify any issues (Caldas & Soares, 2021; Abdullahi et al., 2019).

A key distinction lies in their focus: QA is about ensuring the *how* of the construction process, while QC is about verifying the *what* of the final output. QA is a management tool that can involve all members of the project team through planned and systematic activities aimed at preventing errors. In contrast, QC is often carried out by specific individuals such as quality inspectors and project engineers who are tasked with monitoring and evaluating the work to ensure compliance with the established standards (Cheung et al, 2019).

Furthermore, QA is a continuous and forward-looking process that aims to continuously improve construction processes and methods to enhance the overall quality of the project. It is about setting quality standards to be followed across the entire project lifecycle. Conversely, QC is more immediate and focuses on detecting and correcting any issues in the finished product that do not comply with the quality requirements outlined in the QA plan. Its primary goal is to guarantee that the completed work adheres to the standards set forth in the QA plan (Paredes, 2024).

2.4 Empirical Review

Empirical studies in Nigeria demonstrate that the presence and proper implementation of quality assurance mechanisms such as Quality Management Systems (QMS), building code enforcement, materials testing, and professional supervision play a critical role in reducing building collapse incidences. However, their effectiveness is often undermined by weak regulatory enforcement, low management commitment, the use of substandard materials, and poor institutional coordination (Okunola, 2022; Awoyera et al., 2021; Obiora et al., 2022; Abdullahi et al., 2019). Studies show that systemic issues, such as corruption, inadequate professional supervision, and non-compliance with building codes, contribute significantly to the persistence of building failures across the country (Ede, 2010; Oyegbile & Akinyemi, 2020). Although regulatory bodies in Edo State have recently increased oversight, resulting in reports of zero recorded building collapse in 2022, localized empirical research specific to Benin City remains scarce indicating a gap in understanding how quality assurance mechanisms operate and influence outcomes in the state (SON, 2023; Obiora et al., 2022).

2.4.1 Key Quality Assurance Mechanisms for Collapse Prevention

Ensuring structural integrity in building projects relies heavily on the effective implementation of quality assurance mechanisms throughout the construction process. These mechanisms serve as systematic controls that regulate material standards, professional competence, and compliance with regulatory requirements, thereby minimizing risks associated with structural failure. Strengthening quality assurance practices is therefore critical to preventing building collapse and safeguarding lives, property, and public confidence in the built environment. Shown in the table 2.1 is the summary of Quality Assurance Mechanisms for collapse prevention.

Table 2.1: Key Quality Assurance Mechanisms for Collapse Prevention

S/N	Quality Assurance Mechanism	Description	Source
1	Building Codes & Regulations	Legal frameworks such as the National Building Code and Edo State building regulations guide construction safety standards.	Federal Republic of Nigeria, (2017)
2	Quality Management Systems (QMS)	Adoption of ISO 9001 and structured project QA/QC frameworks.	ISO, (2015)
3	Material Testing & Inspection	Laboratory verification of cement, steel, sand, and concrete quality.	Nwokoro, (2018)
4	Site Supervision & Monitoring	Oversight by architects, engineers, and regulators to ensure design compliance.	Olagunju, (2020)
5	Quality Control Plans & Checklists	Documentation that outlines QA procedures and performance benchmarks.	Adeyemi, (2019)
6	Third-Party Audits	External independent reviews of construction practices.	Afolabi, (2021)
7	Training & Capacity Building	Continuous professional development for artisans and professionals.	Olagunju, (2020)
8	Technological Tools (e.g., BIM)	Use of Building Information Modelling (BIM), drones, and sensors for QA.	Afolabi, (2021)
9	Defect Liability Period & Snagging	Post-construction monitoring to correct errors before handover.	Adeyemi, (2019)
10	Risk Assessment & Mitigation	Identification of potential risks and proactive corrective measures.	Nwokoro, (2018)

Table 2.1: Key Quality Assurance Mechanisms for Collapse Prevention (Cont'd)

S/N	Quality Assurance Mechanism	Description	Source
11	Process Standardization / Work Procedures	Standard operating procedures and workflows defined to reduce variability and ensure compliance.	TRB, (2018)
12	Personnel Qualification & Certification	Ensuring workers and professionals hold relevant qualifications and certifications.	TRB, (2018)
13	Laboratory / Third-Party Accreditation	Use of accredited labs or certifying agencies to validate test results.	TRB, (2018)
14	Statistical Quality Control	Application of statistical tools (sampling, control charts) to monitor process stability.	Adenuga, (2019)
15	Internal Quality Audits	Periodic internal review of QA processes, documentation, and corrective actions.	Adenuga, (2019)
16	Peer Reviews / Design Reviews	Independent technical reviews of design drawings and specifications before construction.	Chen, (2012)
17	Constructability / Value Engineering Reviews	Early review of designs for ease of construction and cost-effectiveness.	Chen, (2012)
18	Mock-ups / Prototype Works	Small-scale trial construction to validate workmanship and detailing before full execution.	Adenuga, (2019)
19	Inspection Test Plans (ITP)	Predefined inspection points that require approval before proceeding.	Oke, (2020)
20	Contractual Quality Clauses	Embedding performance clauses, warranties, and penalties in contracts.	Chen, (2012)
21	Continuous Monitoring & Feedback Loops	Real-time monitoring of work progress and corrective actions.	Adegbile, (2022)
22	Corrective & Preventive Action (CAPA)	Systematic process for addressing nonconformance and preventing recurrence.	Oke, (2020)
23	Quality Traceability / Record Keeping	Maintaining records and traceability logs for materials, inspections, and tests.	Adegbile, (2022)
24	Risk-Based QA	Prioritizing QA on high-risk and critical construction elements.	Bello, (2021)
25	Supplier / Subcontractor Prequalification	Evaluating and auditing suppliers/subcontractors based on QA capacity and past performance.	Chen, (2012)

Source: Author's Compilation

Several key quality assurance mechanisms are critical in preventing building collapses in Edo State. The development of a detailed QA plan, specifically tailored to the unique requirements of each construction project, is an essential first step. This plan should clearly outline the specific quality goals, the standards that must be met, and the performance metrics that will be used to assess success. Identifying critical milestones throughout the project where QA processes will be implemented is also a vital component of this planning phase (Ezeokoli, 2018).

Conducting thorough risk assessments and developing comprehensive mitigation plans during the pre-construction phase is another crucial QA mechanism. By proactively identifying potential risks that could affect the quality and safety of the building, and by planning strategies to address these risks, construction projects can significantly reduce their vulnerability to failures. Ensuring that all materials, tools, and equipment used in the project meet the specified standards and requirements is also a fundamental aspect of quality assurance. This includes verifying the quality, size, shape, and material composition of all building components (Paredes, 2024).

Research highlights numerous QA mechanisms applied in the Nigerian construction industry:

2.4.2 Factors Influencing the Effectiveness of Quality Assurance Mechanisms

The effectiveness of quality assurance (QA) mechanisms in mitigating building collapse is not uniform; it is shaped by several contextual, institutional, and environmental factors. These factors can either strengthen or weaken the ability of QA systems to prevent structural failures in construction projects (Adeyemi, 2019).

Table 2.2 presents a summary of factors influencing the effectiveness of quality assurance mechanisms

Table 2.2: Factors Influencing the Effectiveness of Quality Assurance Mechanisms

S/N	Factors	Influence on QA Effectiveness	Source
1	Economic Constraints	Limited budgets often lead to substandard materials and shortcuts.	Adeyemi, (2019)
2	Regulatory Enforcement	Weak monitoring by SON, COREN, and local councils leads to poor compliance.	Afolabi, (2021)
3	Skilled Workforce	Shortage of competent engineers and artisans weakens workmanship standards.	Olagunju, (2020)
4	Corruption & Non-Compliance	Bribery undermines building inspections and code enforcement.	Nwokoro, (2018)
5	Client Pressure	Some clients demand cheaper projects, discouraging full compliance.	Adeyemi, (2019)
6	Technological Adoption	Limited use of BIM, digital QA tools, and modern methods reduces efficiency.	Afolabi, (2021)
7	Organizational Culture	Firms prioritizing speed/cost over safety tend to neglect QA.	Olagunju, (2020)
8	Legal & Institutional Framework	Weak judicial enforcement reduces deterrence for offenders.	Federal Republic, (2017)
9	Substandard Materials & Poor Workmanship	Use of low-quality cement, steel, and aggregates reduces structural capacity.	Oke, (2019); Oladapo, (2016)
10	Inadequate Site Investigation	Failure to investigate soil and ground conditions leads to unsafe foundations.	Adebisi, (2020); Oke, (2019)
11	Weak Supervision & Inspection	Infrequent or token inspections allow deviations from approved drawings.	Adebisi, (2020); Oni, (2017)
12	Unqualified Builders / Informal Contractors	Engaging untrained builders leads to non-compliance with standards.	Oke, (2019); Adebisi, (2020)
13	Poor Structural Design & Calculation Errors	Errors in load assessment and incomplete designs undermine QA.	Ezeokoli, (2018); Oke, (2019)

Table 2.2: Factors Influencing the Effectiveness of Quality Assurance Mechanisms (Cont'd)

S/N	Factors	Influence on QA Effectiveness	Source
14	Supply-chain Issues	Procurement of fake or substandard materials weakens building integrity.	Ezeokoli, (2018); Oladapo, (2016)
15	Deficient Material Testing	Absence of reliable testing weakens QA verification.	Oni, (2017); Adebisi, (2020)
16	Poor Procurement Practices	Lowest-bid contracts compromise QA with underqualified contractors.	Nwosu, (2015); Oladapo, (2016)
17	Inadequate Training & CPD	Engineers and inspectors lacking training fail to adopt QA methods.	Okoye, (2019); Oni, (2017)
18	Poor Documentation	Missing test results and logs prevent effective QA audits.	Akinola, (2016); Ezeokoli, (2018)
19	Lack of Independent Review	No peer review means design errors remain undetected.	Babalola, (2017); Okoye, (2019)
20	Aging Infrastructure & Poor Maintenance	Neglected buildings fail even if initial QA was good.	Akinola, (2016); Adebisi, (2020)
21	Rapid Urbanization & Illegal Conversions	Unauthorized extensions overwhelm QA-approved designs.	Oke, (2019); Ezeokoli, (2018)
22	Environmental & Climate Factors	Flooding and subsidence expose weaknesses not addressed by QA.	Ezeokoli, (2018); Adebisi, (2020)
23	Inadequate Equipment	Manual methods reduce workmanship consistency and hinder QA.	Yusuf, (2019); Oni, (2017)

Source: Author's Compilation

2.4.3 Studies on the Efficacy of Quality Assurance Processes and Standards

Research on the efficacy of quality assurance processes and standards has gained increasing attention due to the rising incidence of construction failures and performance deficiencies globally. These studies evaluate how well-established procedures, regulatory frameworks, and industry standards contribute to improving construction quality and preventing structural defects. Understanding the effectiveness of these mechanisms is essential for guiding policy reforms, enhancing professional practice, and ensuring safer and more sustainable built environments.

Table 2.3illustrates the efficacy of quality assurance processes and standards

Table 2.3: Efficacy of Quality Assurance Processes and Standards

S/N	Mechanism	Observed Effectiveness	Source
1	Building Codes & Regulations	Strong legal frameworks significantly reduce collapse incidences when strictly enforced and complied with.	Federal Republic of Nigeria, (2017)
2	Quality Management Systems (QMS)	Structured QMS (e.g., ISO 9001) improves process compliance and reduces defects across projects.	ISO, (2015)
3	Material Testing & Inspection	Regular laboratory testing prevents the use of substandard materials and enhances structural reliability.	Nwokoro, (2018)
4	Site Supervision & Monitoring	Consistent professional supervision ensures adherence to design and workmanship standards, lowering failure rates.	Olagunju, (2020)
5	Quality Control Plans & Checklists	Detailed QC plans increase process consistency and make deviations easier to detect and correct.	Adeyemi, (2019)
6	Third-Party Audits	Independent audits increase accountability and catch non-compliance that internal teams may miss.	Afolabi, (2021)
7	Training & Capacity Building	Continuous training raises competency levels, improving workmanship and reducing errors.	Olagunju, (2020)
8	Technological Tools (e.g., BIM)	Digital tools enhance coordination and detect design clashes early, preventing construction-stage failures.	Afolabi, (2021)
9	Defect Liability Period & Snagging	Post-construction snagging ensures defects are corrected before handover, reducing latent failures.	Adeyemi, (2019)
10	Risk Assessment & Mitigation	Proactive risk management targets high-risk elements and reduces likelihood of critical failures.	Nwokoro, (2018)

Table 2.3: Efficacy of Quality Assurance Processes and Standards (Cont'd)

S/N	Mechanism	Observed Effectiveness	Source
11	Process Standardization / Work Procedures	Standardized procedures reduce variability in execution and improve consistent quality outcomes.	TRB, (2018)
12	Personnel Qualification & Certification	Certified personnel are more likely to follow standards and produce work that meets required specifications.	TRB, (2018)
13	Laboratory / Third-Party Accreditation	Use of accredited labs ensures test results are reliable and trusted for compliance decisions.	TRB, (2018)
14	Statistical Quality Control	Statistical monitoring enables early detection of process instability and reduces systematic defects.	Adenuga, (2019)
15	Internal Quality Audits	Periodic internal audits identify gaps and drive corrective actions before issues escalate.	Adenuga, (2019)
16	Peer Reviews / Design Reviews	Independent design reviews catch technical errors early, preventing design-related failures.	Chen, (2012)
17	Constructability / Value Engineering Reviews	Constructability reviews simplify designs for safer execution and often reduce costly design flaws.	Chen, (2012)
18	Mock-ups / Prototype Works	Mock-ups validate workmanship and detailing, reducing rework and unexpected site errors.	Adeyeye, (2021)
19	Inspection Test Plans (ITP)	ITPs ensure critical inspection points are passed before progress continues, improving quality assurance.	Oke, (2020)
20	Contractual Quality Clauses	Contracts with clear QA clauses incentivize compliance through warranties and penalties.	Chen, (2012)
21	Continuous Monitoring & Feedback Loops	Real-time monitoring enables prompt corrective action, limiting defect propagation.	Adeyeye, (2021)
22	Corrective & Preventive Action (CAPA)	Structured CAPA processes address root causes and prevent recurrence of nonconformities.	Oke, (2020)

Table 2.3: Efficacy of Quality Assurance Processes and Standards (Cont'd.)

S/N	Mechanism	Observed Effectiveness	Source
23	Quality Traceability / Record Keeping	Comprehensive records enable traceability and accountability for materials and inspections.	Adegbile, (2022)
24	Risk-Based QA	Focusing QA on high-risk components yields more effective allocation of quality resources.	Bello, (2021)
25	Supplier / Subcontractor Prequalification	Prequalification reduces the risk of engaging unreliable suppliers, improving overall project quality.	Chen, (2012)

Source: Author's Compilation

QA mechanisms have been proven to reduce building failures when effectively implemented. For example, Edo State recorded zero collapses in 2022 due to strict regulatory compliance (Edo State Government, 2022). However, lapses in supervision led to the collapse of a student hostel near the University of Benin in 2024 (Vanguard, 2024).

The effectiveness of quality management practices, particularly quality assurance (QA) and quality control (QC), in the construction industry has been the subject of numerous studies. Research consistently indicates that implementing robust quality management systems is essential for ensuring the success of construction projects, mitigating potential risks, and enhancing the satisfaction of all stakeholders involved. By proactively integrating quality planning, assurance, and control measures into project management processes, construction firms can significantly minimize defects, optimize the utilization of resources, and achieve project objectives more effectively.

2.4.4 Gaps in Literature

Despite the availability of multiple QA mechanisms, building collapses continue in Edo State due to weak enforcement, corruption, and inadequate training. While literature acknowledges QA effectiveness, there is limited empirical evidence specifically measuring their influence on collapse incidences in Edo State.

2.5 Summary of Literature Review

The literature reviewed shows that QA mechanisms such as building codes, material testing, supervision, and training are vital in preventing building collapses. However, their effectiveness in Edo State is influenced by economic, regulatory, institutional, and cultural factors. Where mechanisms are strictly enforced, collapse incidences reduce significantly; where they are ignored, failures persist.

CHAPTER THREE

RESEARCH METHODS

3.1 Preamble

This chapter presents the procedures adopted to achieve the objectives of the study titled "Influence of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences in Benin City." It covers the area of study, research design, target population, sampling technique and sample size, data requirements and sources, research instrument, data collection procedures, and methods of data analysis.

3.2 Area of Study

The study is confined to Benin City, the capital of Edo State, Nigeria. Benin City is the commercial and administrative centre of the state and records a high volume of building and infrastructure development. Despite the presence of regulatory frameworks such as the Nigerian Building Code and the Edo State Development and Building Control Agency (EDBCA), cases of building collapse have been reported (Abdullahi et al., 2019; Afolabi, 2021). These characteristics make the city an appropriate focus for investigating how quality-assurance mechanisms can mitigate such occurrences.

3.3 Research Design

The study adopts a quantitative survey research design, which is suitable for collecting measurable data and testing relationships between variables (Creswell & Creswell, 2018). This design enables systematic analysis of how quality-assurance mechanisms such as regulatory inspections, professional supervision, and material testing affect the incidence of building collapse.

3.4 Research Approach

A quantitative approach was primarily employed in this study, utilizing structured questionnaires to obtain numerical data on the prevalence of quality assurance practices and their relationship to building collapse prevention (Bryman, 2016). In addition, supplementary qualitative input was incorporated through brief interviews with key regulatory officers. These interviews were intended to provide contextual clarification on issues relating to enforcement and monitoring within the construction industry (Neuman, 2014).

3.5 Target Population

The target population for this study comprises stakeholders directly involved in building construction, regulatory enforcement, and land administration within Benin City. This population includes registered architects who are members of the Nigerian Institute of Architects (NIA), civil and structural engineers affiliated with the Nigerian Society of Engineers (NSE), and builders or contractors under the Nigerian Institute of Builders (NIOB). Also included are quantity surveyors registered with the Nigerian Institute of Quantity Surveyors (NIQS), estate surveyors and valuers who belong to the Nigerian Institution of Estate Surveyors and Valuers (NIESV), and land surveyors who are members of the Nigerian Institution of Surveyors (NIS). Additionally, regulatory officers from the Edo State Development and Building Control Agency, responsible for building plan approvals and site inspections, constitute an essential part of the target population.

These professional groups were selected because they are directly responsible for design approval, supervision, and enforcement of standards that influence building integrity and safety (Famakin et al., 2012).

3.6 Sampling Technique and Sample Size

Sampling involves selecting a subset of the population to represent the whole (Pilot & Hungler, 2005). A purposive sampling technique will be adopted to identify respondents who possess practical knowledge of quality assurance and building-collapse issues. Stratification will ensure proportional representation of each professional category (Etikan et al., 2016).

Using Yamane's (1967) formula at a 95 % confidence level and a 5 % margin of error and based on professional registers and preliminary checks, a total population of about 811 relevant professionals in Benin City was used to determine the required sample size for the study. This yields a sample size of roughly 268 respondents, distributed as follows in table 3.1.

Table 3.1: Professional Agency and their Population Size

S/N	Bodies	Profession	Target Population	Sample Size @ (33.05%)
1	NIA	Registered Architects	95	31
2	NSE	Engineers	110	36
3	NIOB	Builders/Contractors	250	83
4	NIQS	Quantity Surveyors	123	41
5	NIESV	Estate Surveyors & Valuers	140	46
6	NIS	Land Surveyors	93	31
	Total		**811**	**268**

In determining the appropriate sample size for this study, the Yamane (1967) formula for sample size calculation was employed. The formula provides a simplified method for deriving a representative sample from a known population, particularly when the sampling frame is large. According to Yamane, the required sample size n can be calculated using the expression:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

'N' represents the total population size and 'e' denotes the acceptable margin of error or level of precision. The formula ensures that the selected sample adequately reflects the characteristics of the entire population while minimizing sampling error. It is commonly applied in social science research due to its efficiency, cost-effectiveness, and statistical reliability, especially in survey-based studies.

The use of the Yamane formula in this research enabled the calculation of a sample size that is sufficient for generalizing the findings with a confidence level typically set at 95% and a standard margin of error of 5%. By adopting this approach, the study guarantees that conclusions drawn from the selected sample can be reasonably inferred to the wider population.

3.7 Data Needs and Sources

Primary Data: First-hand information obtained through questionnaires administered to professionals and regulatory officers within Benin City (Neuman, 2014). Secondary Data: Existing records of reported building collapses, inspection reports, and policy documents from the Edo State Development and Building Control Agency and other professional bodies (Awoyera et al., 2021).

3.8 Research Instrument

Data for this study were collected using a structured, self-administered questionnaire. The instrument was developed following an extensive review of literature on building collapse and quality assurance (Adebayo et al., 2019; Kaigama, 2015) and subsequently adapted to reflect the local context of the study area. The questionnaire was divided into two major sections. Section A focused on background information and captured respondents' demographic characteristics and professional profiles. Section B assessed quality assurance mechanisms and included items designed to measure the level of agreement and perceived effectiveness of various quality assurance practices and related factors. Responses in this section were rated using a five-point Likert scale, in accordance with the scaling approach introduced by Likert (1932). The questionnaire consisted primarily of close-ended questions to enhance clarity and facilitate quantitative analysis.

3.9 Method of Data Collection

Data will be collected electronically. Soft copies of the questionnaire will be distributed via email and online survey platforms to enhance response rates (Dillman et al., 2014).

3.10 Method of Data Analysis

The study will employ descriptive statistics to analyze the data (Field, 2018 Mean Item Score (MIS): The MIS will be used to determine the relative significance of each quality-assurance mechanism in mitigating building collapse, applying the formula: MIS = (5n5 + 4n4 + 3n3 + 2n2 + 1n1) / N

Where n1 = number of respondents who chose Very Low, n2 = Low, n3 = Moderate, n4 = High, n5 = Very HiFgh, N = total number of responses.

The Mean Item Score (MIS) technique will be employed in this study to investigate the factors influencing the effectiveness of quality assurance mechanisms in mitigating building collapse incidences within the study area. This analytical approach will enable the ranking and comparison of respondents' perceptions regarding the relative importance and impact of various quality assurance factors on collapse prevention. In addition, MIS will be utilized to assess the overall level of effectiveness of existing quality assurance mechanisms implemented in the region, thereby providing a quantitative basis for determining the extent to which these measures contribute to reducing structural failures. Through this method, the study will generate empirical insights necessary for prioritizing critical intervention areas and improving construction quality management practices.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Preamble

This chapter presents the data collected for the study, the procedures used for data analysis, and the findings derived from the analysis. The data were obtained from respondents through the administration of structured questionnaires designed to assess quality assurance mechanisms and their effectiveness in mitigating building collapse within Benin City.A total of 268 questionnaires were distributed among the identified professional groups and regulatory stakeholders. Out of these, 200 were correctly completed and returned, representing a valid response rate of 84%. This high rate of return enhances the credibility and reliability of the findings, as it indicates strong participation and adequate representation of the target population. The analysis presented in this chapter therefore reflects perspectives across the major professional categories involved in building construction and regulatory processes within the study area.

4.2 Background Information of Respondents

The section provides the demographic and occupational profile of the 200 respondents to the research. The information provides a rich description of the average professional within the Nigerian construction industry sector being researched. Of the respondents, 109 (54.50%) were men and 91 (45.50%) were women, reflecting the traditional male dominance of Nigeria's construction industry. As far as education is concerned, the group was well-educated., 52 (24%) of the respondents had an B.Tech, 3 (3%) of the participants had an HND, and 45 (23%) had a BSc, 32 (16%) of the respondents had an MSc, 34 (17%) of the respondents are MBA holders and 34 (17%) as the highest level of attainment had a PhD. This is indicative of a strong emphasis on high levels of education among the respondents.

In terms of work experience, the interviewees were highly experienced in the field and provided good practical views. To be specific, 32 (16%) had less than 5 years of experience, 45 (22%) had from 5-10 years of experience, 38 (19%) had from 11- 20 years of experience, 46 (23%) had 21 - 25 years of experiences, and 39 (19%) had more than 20 years of experience.

Professional affiliations were also scrutinized. NIOB was the dominant certification, with 72 (36%) respondents holding it. Other affiliations were NIA (21, 19%), NIESV (35, 17%), NIQS (31, 15%), NSE (25 %) and NIS (16, 15%).

Finally, a professional analysis of the survey respondents found there were the greatest numbers of Engineers at 25 (12%), Architects at 21 (10%), and Quantity Surveyors at 31 (15%). There were 72 (36%) Builders, Estate Surveyors and Valuers 35 (17%) and Land Surveyors 16 (8%). The dominance of senior and technical positions by experienced, qualified practitioners is part of what gives the data obtained prestige and credibility. Presented As shown in Table 2.1, is a summary of the demographic presentation of data.

4.1: Demographic Presentation of Data

Categories	Description	Frequency	Percentage
Gender of Respondent	Male	109	55%
	Female	91	45%
	Total	**200**	**100%**
Highest Educational Qualification of Respondents	B.Tech/BSc	97	47%
	HND	3	3%
	MSc/MBA	66	33%
	Doctor of Philosophy (PhD)	34	17%
	Total	**200**	**100%**
Years of Professional Experience	<5	32	16%
	11-20	38	19%
	21-25	46	23%
	5-10	45	22%
	Above 25	39	19%
	Total	**200**	**100%**
Professional Body	NIA	21	10%
	NIESV	35	17%
	NIOB	72	36%
	NIQS	31	15%
	NIS	16	8%
	NSE	25	12%
	Total	**200**	**100%**
Profession	Architect	21	10%
	Builder	72	36%
	Engineer	25	12%
	Estate Surveyors and Valuers	35	17%
	Land Surveyors	16	8%
	Quantity Surveyors	31	15%
	Total	**200**	**100%**

This study shows the quality assurance mechanisms for mitigating building collapse in Edo State. The table below gives us results drawn from the responses of respondents as regards to assurance mechanism for mitigating building collapse incidences. The table shows the mean item scores (MIS) and standard deviations (SD) for different quality assurance mechanisms used to reduce building collapse in Edo State. These mechanisms are ranked from the most important to the least important based on the respondents' opinions in table 4.2.

Table 4.2: Quality Assurance Mechanisms for Mitigating Building Collapse in Edo State

Quality Assurance Mechanism	MIS	S.D	RANK
Quality Control Plans & Checklists	4.10	0.802	1
Defect Liability Period & Snagging	4.09	0.843	2
Laboratory / Third-Party Accreditation	4.07	0.833	3
Risk-Based QA	4.07	0.842	4
Mock-ups / Prototype Works	4.06	0.816	5
Supplier / Subcontractor Prequalification	4.05	0.804	6
Technological Tools (e.g., BIM)	4.05	0.835	7
Constructability / Value Engineering Reviews	4.04	0.788	8
Quality Traceability / Record Keeping	4.03	0.798	9
Personnel Qualification & Certification	4.02	0.805	10
Risk Assessment & Mitigation	4.02	0.808	11
Site Supervision & Monitoring	4.02	0.820	12
Statistical Quality Control	4.01	0.776	13
Material Testing & Inspection	3.98	0.819	14
Contractual Quality Clauses	3.98	0.820	15
Training & Capacity Building	3.96	0.788	16
Building Codes & Regulations	3.96	0.813	17
Third-Party Audits	3.96	0.826	18
Inspection Test Plans (ITP)	3.96	0.838	19
Internal Quality Audits	3.94	0.823	20
Quality Management Systems (QMS)	3.94	0.824	21
Corrective & Preventive Action (CAPA)	3.94	0.831	22
Process Standardization / Work Procedures	3.94	0.837	23
Continuous Monitoring & Feedback Loops	3.93	0.805	24
Peer Reviews / Design Reviews	3.92	0.847	25

From the table above, quality control plans shows to be a reliable mechanism for building mitigation in Edo State as majority of the respondents strongly agree and ranking highest with an average mean of 4.10with a standard deviation of 4.802 which shows that great number of respondents strongly agree to the item. On the other hand, Peer Reviews/Design reviews ranked low with an average mean of 3.92 with a standard deviation of 4. 847. This shows that Quality Control Plan has more effective assurance in contrast to Peer Reviews as one of the mechanisms for mitigating building collapse in Edo State. This conclusion was drawn based on some environmental factors that pertain to housing in Edo State.

The findings presented in Table 4.2 show that respondents consider a wide range of quality assurance mechanisms essential for mitigating building collapse in Edo State, with mean importance scores ranging from 4.10 to 3.92. These consistently high values demonstrate a strong collective agreement that preventing collapse requires a comprehensive, systematic and well-coordinated approach to quality management across the entire construction process. The narrow spread of the mean scores reinforces the understanding that no single mechanism is sufficient in isolation; rather, effective collapse prevention relies on a combination of procedural, technical, managerial and regulatory instruments that work together to safeguard structural safety.

The mechanisms ranked highest Quality Control Plans and Checklists (MIS = 4.10), Defect Liability Period and Snagging (MIS = 4.09), and Risk-Based Quality Assurance (MIS = 4.07) illustrate a strong preference for structured and well-documented procedures that guide construction activities and help establish clear accountability throughout the building lifecycle. Previous studies have similarly highlighted the value of checklists and defect management strategies in reducing errors and identifying non-compliance before they develop into major structural issues. Research has also emphasized that risk-based planning and proactive hazard identification are critical components of modern construction governance, contributing significantly to the prevention of collapse incidents (Adenuga, 2019). These results therefore suggest that the most effective mitigation tools may be those integrated directly into daily site operations, planning documentation and contractual obligations, rather than those depending solely on external regulation.

Mechanisms ranked in the upper range such as Laboratory or Third-Party Accreditation (MIS = 4.07), Mock-ups and Prototype Works (MIS = 4.06) and Technological tools such as BIM (MIS = 4.05) demonstrate the importance placed by respondents on independent verification, early performance testing and digital coordination. This pattern agrees with existing research showing that material failure and inadequate testing are core contributors to building collapse in Nigeria, and that independent laboratory assessment and prototype testing help detect weaknesses before full-scale implementation. Likewise, the use of digital platforms such as BIM has been associated with improved collaboration, reduced design interference, and enhanced construction accuracy, though adoption continues to be limited by cost and technical capacity challenges (Ezeokoli, 2018). These findings imply that improved access to testing facilities and construction technology would significantly improve QA outcomes within the local industry.

The mid-ranked mechanisms, including Site Supervision and Monitoring (MIS = 4.02), Personnel Qualification and Certification (MIS = 4.02), Risk Assessment and Mitigation (MIS = 4.02) and Quality Traceability and Record Keeping (MIS = 4.03), highlight the ongoing relevance of human expertise and field-level oversight. Prior research consistently identifies poor supervision, inadequate skill levels and weak documentation practices as key predictors of structural failure and collapse (Chen 2012; Olotuah & Bobadoye, 2009). This alignment between literature and respondent perception suggests that strengthening professional competencies and enforcing rigorous certification requirements are necessary components of an effective QA framework. Without sustained investment in skills and supervision, improvements in testing and regulatory policies may not translate into practical outcomes on construction sites.

Lower-ranked mechanisms such as Inspection Test Plans (ITP), Third-Party Audits, Building Codes and Regulations, Quality Management Systems, Continuous Monitoring and Feedback

Loops, and Peer or Design Reviews (MIS = 3.92–3.98) are still perceived as important, though more challenging to apply effectively. The lower rankings likely reflect known institutional constraints, including weak regulatory capacity, inconsistent enforcement and limited access to specialised auditing and monitoring systems. Previous studies likewise observe that despite the existence of building codes, enforcement gaps and insufficient regulatory personnel undermine their potential effectiveness (Oke, 202o). These results highlight the need for institutional strengthening through increased staffing, digital permit and inspection processes, and stronger audit systems to enhance compliance and accountability.

4.3 Factors Influencing the Effectiveness of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences

The findings of this study reveal a multidimensional set of factors perceived by respondents as influencing the effectiveness of quality-assurance (QA) mechanisms in mitigating building collapse. The mean scores, ranging narrowly between 3.71 and 3.42, indicate a strong consensus that all the factors identified play significant roles in determining the reliability of QA systems. The clustering of these mean values suggests that stakeholders do not attribute the causes of building collapse to isolated issues, but rather view them as the outcome of complex, interconnected deficiencies in construction materials, regulatory enforcement, technical supervision, design accuracy, and institutional practices. This reinforces the position that building collapse is a systemic problem rather than a random or singular failure. Table 3.9 provides an overview of factors influencing the effectiveness of quality assurance mechanisms in mitigating building collapse incidences ranked in other of MIS

Table 4.3: Factors Influencing the Effectiveness of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences

Factors	Mean	S.D	Rank
Supply-chain issues (fake or substandard materials)	3.71	1.146	1
Weak enforcement by regulatory bodies	3.67	1.179	2
Economic constraints (limited budgets leading to poor quality)	3.63	1.095	3
Poor procurement practices (lowest-bid contracts)	3.62	1.110	4
Pressure to minimize costs by clients	3.61	1.164	5
Inadequate or poor supervision	3.60	1.139	6
Environmental/climate factors (flooding, subsidence, etc.)	3.59	1.126	7
Inadequate site investigation before construction	3.58	1.105	8
Inadequate training and lack of continuous professional development	3.57	1.082	9
Aging infrastructure and poor maintenance culture	3.56	1.133	10
Poor structural design and calculation errors	3.55	1.120	11
Corruption/bribery in approval and inspection processes	3.54	1.177	12
Non-compliance with building codes and standards	3.53	1.102	13
Cultural attitudes of shortcuts in construction	3.52	1.056	14
Rapid urbanization and unauthorized conversions/extensions	3.52	1.116	15
Use of substandard materials	3.51	1.084	16
Deficient material testing during construction	3.50	1.116	17
Lack of independent review/peer checking of designs	3.49	1.121	18
Weak supervision and infrequent inspections	3.48	1.065	19
Poor documentation of QA processes and results	3.47	1.070	20
Engagement of unqualified builders/informal contractors	3.44	1.068	21
Lack of skilled workforce and artisans	3.43	1.073	22
Inadequate equipment and reliance on manual methods	3.42	1.113	23

Among the identified factors, supply-chain issues and the use of substandard construction materials were ranked as the most influential. This finding aligns with prior research, which consistently highlights defective materials and weak material control as prominent contributors to structural failure in Nigeria (Okunola, 2022). Several systematic reviews have similarly reported that a significant proportion of collapse incidents stem directly from the use of poor-quality materials and the lack of rigorous testing and certification procedures. Such findings reinforce the argument that material procurement represents a critical vulnerability within the construction industry, particularly in contexts where informal supply chains dominate and regulatory oversight is weak.

Weak enforcement of building codes and development control was the second highest-ranked factor. Previous studies emphasise that although building standards exist, the institutional capacity required to enforce compliance remains inadequate, resulting in insufficient monitoring of construction activities and poor inspection regimes. The literature notes that ineffective enforcement enables the circumvention of professional standards, thereby creating conditions in which substandard construction practices flourish. These findings suggest that regulatory weakness does not merely coexist with other risk factors; rather, it amplifies them by reducing accountability within the construction process.

Economic pressures, cost-cutting incentives, and lowest-bid procurement mechanisms were also ranked highly by respondents. This aligns with studies such as (Adebisi ,2020) and (Chen, 2012), which found that competitive pricing strategies in project procurement often lead contractors to compromise standards, reduce supervision, and adopt shortcuts that undermine QA procedures. The findings therefore support the argument that financial considerations can override professional judgment and technical quality when the procurement environment prioritizes cost minimization over safety and durability.

Middle-ranked factors including inadequate supervision, lack of continuous professional development (CPD), shortage of skilled personnel, insufficient site investigations, structural design errors, weak material testing procedures, and poor documentation corroborate earlier research attributing collapse incidents to human error, professional incompetence, and institutional weakness. Studies have shown, for example, that more than half of collapse cases result from poor workmanship and design flaws, highlighting persistent deficiencies in technical capacity and oversight across project delivery chains.

Although factors such as corruption, disregard for approved drawings, non-compliance with codes, and a "shortcut" construction culture were ranked lower, they are nevertheless important. Their effects are indirect but foundational: they create enabling environments within which technical and material failures occur unchecked. Earlier studies similarly identify corruption, unauthorized structural modifications, inadequate soil testing, and poor maintenance culture as recurrent underlying contributors to structural failure, revealing a deeper institutional crisis in governance and accountability.

Overall, the convergence between the findings of this study and existing literature suggests that building collapse in Nigeria is driven by systemic and structural failures embedded within the economic, regulatory, technical, and cultural fabric of the construction sector. These patterns indicate that mitigation measures cannot rely on single-solution strategies such as improving material standards alone or enhancing supervision in isolation. Instead, a comprehensive, multi-layered intervention is required, integrating strengthened regulatory enforcement, improved supply-chain monitoring, professional capacity development, reform of procurement practices, and a cultural shift toward compliance and accountability. Without addressing these interconnected components, quality-assurance mechanisms will remain vulnerable, and collapse incidents are likely to persist.

4.4 Assessment of the Effectiveness of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences

Table 4.4 shows the Assessment of the Effectiveness of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences. Form the above table, Continuous monitoring and feedback loops serves as one of the effective ways to assess the mechanisms in mitigating building collapse incidences as strongly agreed by majority of respondents with an average mean of 4.54 and a standard deviation of 0.510, followed by Mock-ups / Prototype Works with an average mean of 4.53and a standard deviation of 0.500. This shows that average respondents strongly agree to the requirement for assessing the effectiveness of quality assurance mechanism in mitigating building collapse incidence.

On the other hand, Third party Adults and Quality Traceability/ Record Keeping rank low with an average mean of 4.42 with a standard deviation of 0.505 as the higher the mean, the lower the standard deviation shows that a key number of respondent are in full agreement with the item, and the lower the mean the higher standard deviation shows a lower support from respondents to an item selected. Table 4.4 presents the variables under consideration.

Table 4.4: Assessments of the Effectiveness of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences

Assessments of Quality Assurance Mechanisms	MIS	S.D	Rank
Continuous Monitoring & Feedback Loops	4.54	0.510	1
Mock-ups / Prototype Works	4.53	0.500	2
Quality Control Plans & Checklists	4.51	0.521	3
Peer Reviews / Design Reviews	4.51	0.530	4
Training & Capacity Building	4.50	0.501	5
Building Codes & Regulations	4.50	0.519	6
Internal Quality Audits	4.50	0.520	7
Laboratory / Third-Party Accreditation	4.50	0.521	8
Site Supervision & Monitoring	4.50	0.530	9
Personnel Qualification & Certification	4.50	0.549	10
Material Testing & Inspection	4.50	0.558	11
Inspection Test Plans (ITP)	4.49	0.501	12
Process Standardization / Work Procedures	4.49	0.530	13
Supplier / Subcontractor Prequalification	4.48	0.511	14
Contractual Quality Clauses	4.47	0.529	15
Corrective & Preventive Action (CAPA)	4.46	0.500	16
Statistical Quality Control	4.46	0.501	17
Defect Liability Period & Snagging	4.46	0.509	18
Quality Management Systems (QMS)	4.46	0.519	19
Risk Assessment & Mitigation	4.45	0.499	20
Risk-Based QA	4.45	0.508	21
Technological Tools (e.g., BIM)	4.44	0.526	22
Constructability / Value Engineering Reviews	4.43	0.516	23
Third-Party Audits	4.42	0.504	24
Quality Traceability / Record Keeping	4.42	0.505	25

The results presented in Table 4.4 show that respondents perceive a wide range of quality assurance mechanisms as highly effective in mitigating building collapse, with mean importance scores ranging from 4.54 to 4.42. These consistently high values demonstrate a strong consensus that collapse prevention requires a comprehensive and integrated approach that spans continuous monitoring, verification, skilled personnel, and regulatory compliance. The narrow variation in mean scores reinforces the idea that building safety cannot be achieved through a single mechanism; instead, a combination of strategies must operate together across the project lifecycle.

Continuous Monitoring and Feedback Loops, which received the highest rating (MIS = 4.54), were identified as the most effective quality assurance mechanism. This suggests that respondents attach great importance to ongoing oversight and real-time evaluation processes on construction sites. Such a finding aligns with research emphasizing that continuous monitoring improves traceability, ensures that project decisions remain aligned with technical standards, and supports early detection of deviations that could lead to structural failure (Oladapo, 2016). Similarly, (Okoye, 2023) explains that continuous monitoring reduces the likelihood of procedural and workmanship errors, thereby enhancing quality consistency from foundation to completion.

Mock-ups and Prototype Works (MIS = 4.53) were ranked second, highlighting their role in validating performance expectations and identifying design or constructability issues before full-scale implementation. This finding corresponds with earlier studies which state that prototype testing is a valuable tool for exposing design weaknesses and material incompatibilities prior to actual construction, thereby reducing risk. Peer Reviews and Design Reviews (MIS = 4.51), ranked third, are also widely recognized in the literature as an effective means of enhancing technical precision and reducing design-related collapse incidents by enabling independent professional evaluation (Oni, 2017).

Traditional quality assurance practices such as Quality Control Plans and Checklists, Material Testing and Inspection, Personnel Qualification and Certification, Site Supervision, and Third-Party Laboratory Accreditation (MIS = 4.51–4.50) were also strongly endorsed by respondents. This supports findings from previous research which report that poor supervision, low professional competence, and inadequate material testing are among the most common factors contributing to structural failures and building collapse in Nigeria. Nwokoro (2018) similarly notes that a significant proportion of collapse cases result from the absence of rigorous testing and verification procedures, reinforcing the importance of certified personnel and accredited laboratory testing in ensuring compliance with structural requirements.

Mechanisms such as Internal Quality Audits, Building Codes and Regulations, Training and Capacity Building, Process Standardization, and Inspection Test Plans (MIS = 4.50–4.49) were moderately ranked, suggesting that while recognized as important, their effectiveness may depend on organizational and institutional implementation capacity. This aligns with studies which argue that building code enforcement remains weak in many parts of Nigeria due to limited regulatory capacity and monitoring challenges (Oni, 2017). Consequently, professional training and standardized processes are regarded as essential tools for strengthening QA frameworks and reducing operational variability.

Lower-ranked but still strongly rated mechanisms, including Quality Management Systems (QMS), Contractual Quality Clauses, Risk-Based Quality Assurance, Risk Assessment and Mitigation, Technological Tools such as BIM, and Constructability Reviews (MIS = 4.46–4.43), indicate that respondents acknowledge their value but may view them as more difficult to implement due to cost, specialization or administrative constraints. Prior research supports this interpretation, noting that technological and advanced QA tools are often underutilized in developing construction sectors due to limited awareness, inadequate training and weak organizational culture (Ede, 2010; Okoye, 2019). Third-Party Audits and Quality Traceability/Record Keeping (MIS = 4.42), positioned at the bottom of the ranking, may reflect limited current adoption or perceived logistical barriers rather than lack of effectiveness. Similar concerns have been raised in studies that highlight the insufficient availability of independent auditing services and poor documentation culture as persistent challenges (Makul, 2019).

Collectively, these findings demonstrate alignment with the existing body of literature emphasizing that collapse mitigation is fundamentally systemic rather than singular. Effective prevention requires coordinated reforms across regulatory enforcement, professional capacity building, certification processes, digital transformation and continuous monitoring practices. Without integrated implementation, quality assurance mechanisms risk operating in isolation, reducing their overall impact and allowing conditions that lead to collapse to persist.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Preamble

This chapter presents the culmination of the research study titled "Influence of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences in Edo State." The primary aim of this research was to assess the effectiveness of quality assurance (QA) mechanisms in mitigating building collapse incidences within the study area. The preceding chapters established the foundation for this discussion: Chapter 1 introduced the research problem and objectives, Chapter 2 reviewed the relevant theoretical and empirical literature, Chapter 3 detailed the quantitative survey methodology, and Chapter 4 presented the analysis and discussion of the collected data. This chapter synthesizes these elements by providing a concise summary of the key findings, drawing logical conclusions based on the empirical evidence, proposing actionable recommendations for stakeholders, and suggesting pertinent avenues for future research. The purpose is to answer the research questions and articulate the study's contribution to enhancing building safety in Benin City, Edo State.

5.2 Summary of Findings

The analysis of data collected from 200 construction professionals in Benin City yielded significant insights aligned with the research objectives. The findings are summarized as follows:

Regarding Research Objective 1**:** Available Quality Assurance Mechanisms. The study identified and ranked 25 key QA mechanisms available for mitigating building collapse in Edo State. The most prevalent and agreed-upon mechanisms, as indicated by high Mean Item Scores (MIS), include Quality Control Plans & Checklists (MIS=4.10), Defect Liability Period & Snagging (MIS=4.09), and Risk-Based QA (MIS=4.07). Other highly ranked mechanisms were Laboratory/Third-Party Accreditation, Mock-ups/Prototype Works, and the use of Technological Tools like BIM. Conversely, mechanisms such as Peer Reviews/Design Reviews (MIS=3.92) were ranked lowest, suggesting they are less utilized or perceived as less critical in the current local context (Field Data, 2025). This finding aligns with the literature that emphasizes the importance of structured, on-site proactive and reactive quality checks (Adeyemi, 2019; Nwokoro, 2018).

Regarding Research Objective 2 the analysis conducted reveals a complex and interdependent set of influences that collectively shape the effectiveness of quality assurance mechanisms. Ten latent categories emerged from the analysis, with five standing out as particularly consequential. The first and most dominant category Material and Documentation Integrity captures the challenges arising from supply-chain disruptions, the use of substandard materials, inadequate equipment, and poor-quality assurance documentation. Closely following this is the second category, Economic and Infrastructural Pressures, which reflects the pervasive impact of client demands to reduce costs, limited project budgets, and a generally weak maintenance culture.

A third major category, Regulatory and Code Non-Compliance, underscores systemic issues such as corruption and bribery in regulatory approvals, as well as widespread disregard for building codes. The fourth category , Structural and Supervisory Deficiencies, highlights gaps in site supervision and persistent errors in structural design that compromise construction quality. Finally, the fifth category Unqualified Workforce Engagement draws attention to the continued reliance on unskilled builders and informal contractors, a practice that significantly undermines project outcomes.

Taken together, these factors illustrate the multifaceted nature of the challenges confronting QA systems. They align closely with patterns noted in prior studies, which similarly point to the combined effects of economic constraints, corruption, and a shortage of skilled labor as central barriers to achieving consistent quality standards in construction (Afolabi, 2021; Olagunju, 2020; Nwokoro, 2018).

Regarding Research Objective 3: Level of Effectiveness. When assessed for their perceived effectiveness in mitigating collapse, the QA mechanisms received very high ratings. The top five mechanisms deemed most effective were Continuous Monitoring & Feedback Loops (MIS=4.54), Mock-ups / Prototype Works (MIS=4.53), Quality Control Plans & Checklists (MIS=4.51), Peer Reviews / Design Reviews (MIS=4.51), and Training & Capacity Building (MIS=4.50). It is noteworthy that while Peer Reviews were among the least *available*, they were among the most highly rated for *effectiveness*, indicating a recognition of their value despite their underutilization. This high level of perceived effectiveness across the board suggests that professionals believe in the potential of QA mechanisms; however, their actual impact is severely hampered by the influencing factors identified above (Ede, 2010).

5.3 Conclusions

Based on the empirical findings of this study, the following conclusions are drawn. The efficacy of Quality Assurance is context-dependent. While a wide array of effective QA mechanisms is theoretically available and recognized by professionals in Edo State, their practical implementation is not uniform. The reliance on more direct, project-level controls (e.g., checklists, snagging, prototypes) over systemic, peer-review-based mechanisms points to a reactive and on-site focused quality culture, which may be insufficient to catch errors at the design stage.

Building collapse is a symptom of systemic failure, not just technical error.The study conclusively demonstrates that the ineffectiveness of QA is not due to a lack of knowledge about good practices but is primarily the result of deep-rooted, systemic issues. The most critical barriers are corruption in the regulatory system (Factor 3) and the pervasive use of substandard materials (Factor 1), which directly sabotage any technical QA efforts. This supports the "Swiss Cheese Model" of accident causation, where latent failures in the system (e.g., corruption, economic pressure) align with active failures (e.g., design error) to cause a disaster (Reason, 1990). Furthermore, Economic pressures and an unqualified workforce create a vicious cycle. Client-driven cost-cutting (Factor 2) incentivizes the engagement of unqualified contractors (Factor 5) and the procurement of substandard materials, which in turn leads to the need for more intensive supervision and correction a cycle that often fails, resulting in structural compromise. There is a significant gap between knowledge and practice. Construction professionals in Benin City are well-aware of what constitutes effective QA, as shown by the high effectiveness ratings. However, the influencing factors, particularly those related to governance and economics, create an environment where this knowledge cannot be consistently applied, leading to the persistent risk of building collapse.

5.4 Recommendations

Drawing from the study's findings and conclusions, a set of targeted recommendations is proposed to guide industry practitioners, policymakers, and regulatory bodies in Edo State toward strengthening quality assurance practices in the construction sector.

For the Edo State Government and its regulatory agencies, particularly the EDBCA, a renewed emphasis on enforcement and institutional integrity is essential. Approval and inspection processes should be made more transparent, stringent, and technology-driven to reduce opportunities for corruption, aligning with the issues identified under category 3. Practical measures may include mandatory digital submission of architectural and structural designs, GPS-enabled tracking of site inspections, and public disclosure of approval statuses to enhance accountability. Furthermore, certain high-impact quality assurance mechanisms should be elevated to legal requirements. For example, Third-Party Material Certification from accredited laboratories and Independent Peer Review of structural designs for buildings exceeding two storeys should become compulsory conditions for plan approval. Alongside these administrative reforms, public education remains crucial: raising awareness about the risks associated with unqualified builders and the value of verified quality certifications can help generate consumer-driven pressure for better compliance.

Construction firms and professionals also have a decisive role to play by cultivating a proactive and internally driven quality assurance culture. This means moving beyond minimal regulatory compliance and adopting a “Right First Time” mindset across project lifecycles. Firms should invest in continuous monitoring, prototype works, and other preventive measures, especially for complex structural or architectural elements, even when such measures are not directly mandated by clients. Addressing the persistent shortage of skilled labor (category 5) requires deliberate investment in human capital training, certifying, and upskilling both professionals and artisans. Such initiatives should be viewed not as optional expenses but as strategic investments that enhance long-term reputation and reduce the risks associated with construction failures. At the operational level, firms should implement rigorous procurement and documentation systems, including strict prequalification requirements for suppliers and subcontractors, as well as comprehensive quality traceability records to ensure material integrity and provide defensible audit trails.

Professional bodies such as NIOB, NSE, and NIA must reinforce their leadership roles by upholding strict ethical standards among their members. They should take decisive action against professionals implicated in corrupt practices or those who endorse substandard work, thereby strengthening public trust in the profession. In addition, these bodies should frequently organize continuing professional development programs covering modern QA technologies like BIM, ethical decision-making frameworks, and updates to the National Building Code to ensure that practitioners remain aligned with evolving best practices.

Collectively, these recommendations offer a comprehensive pathway to improving QA effectiveness and elevating construction quality across Edo State.

5.5 Areas of Further Studies

Although this study offers substantial insights into the operation and effectiveness of quality assurance mechanisms in Edo State, it also highlights several areas that warrant deeper and more targeted investigation. First, an in-depth qualitative inquiry would be valuable in unpacking the complex dynamics behind the factors identified in the analysis. Through interviews and focus group discussions with builders, regulators, clients, and professional bodies, future research could illuminate the nuanced "how" and "why" underlying persistent issues such as corruption, approval bottlenecks, and the recurrent use of substandard materials.

A second direction involves undertaking comparative regional studies. By examining QA mechanisms and enforcement strategies in states such as Lagos or Rivers—regions with more established regulatory structures—researchers could identify best practices that might be adapted to Edo State, as well as determine which solutions are uniquely context-dependent.

Another promising avenue concerns the assessment of specific technological interventions. Future research could evaluate the cost–benefit implications and practical challenges associated with adopting advanced QA tools such as BIM for automated compliance checking or drones for remote site monitoring, especially within the socio-economic realities of Southern Nigeria.

Finally, a longitudinal study would provide meaningful insights into the long-term effects of policy changes or regulatory reforms. Monitoring outcomes such as building collapse rates and overall construction quality following the introduction of measures like mandatory use of accredited testing laboratories would yield evidence-based guidance for policymakers and further refine QA strategies across the state.

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APPENDIX

RESEARCH QUESTIONNAIRE

Department of Quantity Surveying,
Faculty of Environmental Sciences,
University of Benin,
P.M.B 1154, Ugbowo,
Benin City, Edo State.

Dear Sir/Madam,

REQUEST TO FILL OUT QUESTIONNAIRE

I am a student of the University of Benin, currently undertaking a B.Sc. program in Quantity Surveying. I am carrying out a research on the topic; **'Influence of Quality Assurance Mechanisms in Mitigating Building Collapse Incidences in Edo State.'** You have been selected because of your professional involvement in the construction industry. Kindly assist in completing the attached questionnaire. All information provided will be treated confidentially and used strictly for academic purposes.

Your cooperation is highly appreciated.

Thank you.

Yours sincerely,

EMMANUEL CHUKWUEMEKA IGHEGHE
ighegheemmanuel7318@gmail.com

SECTION A: DEMOGRAPHIC INFORMATION

Please tick (✓) the appropriate box or fill in the blank spaces.

1. Gender:

[ ] Male

[ ] Female

2. Profession of respondent:

[ ] Architect [ ] Engineer [ ] Builder [ ] Quantity Surveyor [ ] Estate surveyors & valuer

[ ] Land Surveyor

[ ] Others: _________

3. Highest Educational Qualification:

[ ] OND/HND [ ] B.Sc./B.Tech [ ] M.Sc./MBA [ ] Ph.D.

[ ] Others: ________(please indicate)

4. Professional body:

[ ] NIA [ ] NSE [ ] NIOB [ ] NIQS [ ] NIESV [ ] NIS

5. Years of Professional Experience:

[ ] <5 years [ ] 5–10 years [ ] 11–20 years [ ] 21-25 years [ ] Above 25 years

SECTION B:

1. QUALITY ASSURANCE MECHANISMS FOR MITIGATING BUILDING COLLAPSE IN EDO STATE

Kindly indicate your level of agreement with the quality assurance mechanism for mitigating building collapse incidences, using the Likert scale provided.

Please use a scale of 1 to 5, where:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

S/N	Quality Assurance Mechanism	Level of Agreement				
		1	2	3	4	5
1	Building Codes & Regulations					
2	Quality Management Systems (QMS)					
3	Material Testing & Inspection					
4	Site Supervision & Monitoring					
5	Quality Control Plans & Checklists					
6	Third-Party Audits					
7	Training & Capacity Building					
8	Technological Tools (e.g., BIM)					
9	Defect Liability Period & Snagging					
10	Risk Assessment & Mitigation					
11	Process Standardization / Work Procedures					
12	Personnel Qualification & Certification					
13	Laboratory / Third-Party Accreditation					
14	Statistical Quality Control					
15	Internal Quality Audits					
16	Peer Reviews / Design Reviews					
17	Constructability / Value Engineering Reviews					
18	Mock-ups / Prototype Works					
19	Inspection Test Plans (ITP)					
20	Contractual Quality Clauses					
21	Continuous Monitoring & Feedback Loops					
22	Corrective & Preventive Action (CAPA)					
23	Quality Traceability / Record Keeping					
24	Risk-Based QA					
25	Supplier / Subcontractor Prequalification					

2. FACTORS INFLUENCING THE EFFECTIVENESS OF QUALITY ASSURANCE MECHANISMS IN MITIGATING BUILDING COLLAPSE INCIDENCES

Kindly agree/disagree with the following factors influencing the effectiveness of quality assurance mechanisms in mitigating building collapse incidences in Edo State. using the Likert scale provided.

Please use a scale of 1 to 5, where:

1 = Strongly Disagree

2 = Disagree

3 = Neutral4 = Agree

5 = Strongly Agree

S/N	Building Collapse Factor	Level of Agreement				
		1	2	3	4	5
1	Use of substandard materials					
2	Inadequate or poor supervision					
3	Non-compliance with building codes and standards					
4	Corruption/bribery in approval and inspection processes					
5	Pressure to minimize costs by clients					
6	Lack of skilled workforce and artisans					
7	Weak enforcement by regulatory bodies					
8	Cultural attitudes of 'shortcuts' in construction					
9	Economic constraints (limited budgets leading to poor quality)					
10	Poor structural design and calculation errors					
11	Inadequate site investigation before construction					
12	Weak supervision and infrequent inspections					
13	Engagement of unqualified builders/informal contractors					
14	Supply-chain issues (fake or substandard materials)					
15	Deficient material testing during construction					
16	Poor procurement practices (lowest-bid contracts)					
17	Inadequate training and lack of continuous professional development					
18	Poor documentation of QA processes and results					
19	Lack of independent review/peer checking of designs					
20	Aging infrastructure and poor maintenance culture					
21	Rapid urbanization and unauthorized conversions/extensions					
22	Environmental/climate factors (flooding, subsidence, etc.)					
23	Inadequate equipment and reliance on manual methods					

3. ASSESSMENT OF THE EFFECTIVENESS OF QUALITY ASSURANCE MECHANISMS IN MITIGATING BUILDING COLLAPSE INCIDENCES

Based on your knowledge and experience, how effective are the following quality assurance mechanisms in reducing the incidences of building collapse in Edo State? Please use a scale of 1 to 5, where:

1 = Not Effective

2 = Slightly Effective

3 = Moderately Effective

4 = Effective

5 = Very Effective.

S/N	Quality Assurance Mechanism	Level of Effectiveness				
		1	2	3	4	5
1	Building Codes & Regulations					
2	Quality Management Systems (QMS)					
3	Material Testing & Inspection					
4	Site Supervision & Monitoring					
5	Quality Control Plans & Checklists					
6	Third-Party Audits					
7	Training & Capacity Building					
8	Technological Tools (e.g., BIM)					
9	Defect Liability Period & Snagging					
10	Risk Assessment & Mitigation					
11	Process Standardization / Work Procedures					
12	Personnel Qualification & Certification					
13	Laboratory / Third-Party Accreditation					
14	Statistical Quality Control					
15	Internal Quality Audits					
16	Peer Reviews / Design Reviews					
17	Constructability / Value Engineering Reviews					
18	Mock-ups / Prototype Works					
19	Inspection Test Plans (ITP)					
20	Contractual Quality Clauses					
21	Continuous Monitoring & Feedback Loops					
22	Corrective & Preventive Action (CAPA)					
23	Quality Traceability / Record Keeping					
24	Risk-Based QA					
25	Supplier / Subcontractor Prequalification					