Analysing Material Management Approaches and Their Effects on Construction Project Performance in Nigeria (A Study of Akwa Ibom Real Estate Sector)

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ABSTRACT

The real estate market in Nigeria has seen impressive growth, largely driven by urbanization and improvements in infrastructure, with Akwa Ibom State playing a pivotal role in this development. One of the key elements that can make or break a construction project is effective material management, as it has a direct effect on costs, timelines, and overall quality. This study dives into the material management strategies used in Akwa Ibom's real estate sector and evaluates how well they work in boosting project outcomes. To gather insights, we used a mixed-methods approach that included semi-structured interviews with 20 stakeholders—like project managers, procurement officers, and suppliers—along with a thorough analysis of procurement documents and project performance data. The research uncovered several common strategies, including just-in-time delivery, vendor-managed inventory, and RFID integration, with just-in-time delivery and RFID standing out for their positive effects on project costs, time efficiency, and quality. However, we also found that issues like logistical disruptions, tech limitations, and delays in material deliveries can really throw a wrench in the works. To tackle these challenges, the study suggests adopting advanced technologies like Building Information Modeling (BIM) and RFID, fostering better collaboration among stakeholders, and investing in training programs to enhance material management practices. These insights can be incredibly useful for stakeholders looking to improve construction project performance and add to the growing knowledge on material management in developing economies.

Keywords: Akwa Ibom state, material management, project performance, real estate sector, sustainable construction

INTRODUCTION

The real estate sector plays a crucial role in driving Nigeria's economic growth, especially with the rapid urbanization and infrastructure development happening in cities like Akwa Ibom (Ogunba et al., 2020). The success of construction projects relies heavily on effective material management, which impacts important factors like project timelines, costs, and overall quality (Alonso et al., 2021). Unfortunately, material management practices in Akwa Ibom's real estate sector are grappling with several challenges, such as procurement inefficiencies, material waste, and logistical hiccups. These problems often result in project delays, budget overruns, and compromised quality (Afolabi & Owolabi, 2021).

To minimize waste, control costs, and ensure materials are delivered on time, effective material management practices are essential (Akintoye et al., 2020). These practices are the backbone of the construction industry, ensuring that the right materials arrive at the site when needed and in the correct quantities (Sogaxa, 2022).

Despite the critical nature of material management, Akwa Ibom's real estate sector still faces significant hurdles, highlighting the need to examine current practices and their impact on project performance. This study aims to

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assess the material management strategies in Akwa Ibom's real estate sector and their effects on project outcomes, providing valuable insights for enhancing material management practices.

Problem Statement/Justification

The real estate market in Nigeria, especially in Akwa Ibom, has seen significant growth, which underscores the importance of effective material management practices. However, there's a noticeable gap in understanding the current material management methods being used in the sector and how they affect project performance.

While various material management strategies are utilized in construction projects, there's a lack of solid evidence regarding their effectiveness in terms of project costs, timelines, and quality outcomes. This leaves industry stakeholders unsure about which strategies to implement for the best project performance (Ibrahim & Daniel, 2021). This study aims to bridge that knowledge gap by exploring the material management techniques used in Akwa Ibom's real estate sector, evaluating their effectiveness and challenges, and providing practical recommendations for improvement.

Objectives Of The Studies

Aim

This study aims to investigate the material management approaches employed in Akwa Ibom's real estate sector and assess their impact on construction project performance. Specifically, the objectives are:

Objectives

1. To examine existing material management strategies employed in construction projects within the Akwa Ibom real estate sector.

2. To identify challenges and constraints associated with current material management practices in Akwa Ibom's real estate projects.

3. To evaluate the effectiveness of these material management strategies in terms of project cost, time, and quality performance.

4. To propose recommendations for enhancing material management approaches to improve construction project performance in the Akwa Ibom real estate sector.

LITERATURE REVIEW

Material management plays a crucial role in the success of construction projects. It encompasses various processes such as planning, procurement, logistics, and waste control (Brutus & Chiyem, 2020). When managed effectively, it can significantly influence project performance in terms of time, cost, and quality. However, challenges like technological limitations and delivery delays can impede efficiency. Thankfully, innovations such as Radio Frequency Identification (RFID) and Building Information Modeling (BIM) provide promising solutions. This chapter explores Lean Construction Theory as the theoretical framework for the study, focusing on its application in material management to enhance construction project outcomes. Additionally, it reviews existing literature on the concept, processes, and practices of material management, examining its impact on project performance, the challenges faced, and the innovations emerging in the field.

Theoretical Framework

Lean Construction Theory: Lean construction, derived from lean manufacturing, emphasizes reducing waste and maximizing value (Koskela, 2021).

Key principles include:

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Value: Deliver customer value while minimizing waste (Ballard, 2021).

Just-in-Time Delivery: Minimizing material storage through timely deliveries (Koskela, 2021).

Continuous Improvement: Constantly refining processes to eliminate inefficiencies (Liker, 2022).

Technological Innovations in Material Management

Recent technologies such as Building Information Modeling (BIM) and Radio Frequency Identification (RFID) have enhanced material management by streamlining procurement and inventory tracking (Zulkifli et al., 2021). While these technologies improve efficiency, their adoption remains limited in developing countries like Nigeria due to high costs and technological infrastructure gaps (Albert et al., 2022).

Concept of Material Management

The concept of Material Management is all about the organized approach to planning, acquiring, handling, storing, and distributing materials. The goal is to ensure that the right materials, in the right quality and quantity, are available at the right place and time—all while keeping costs in check to support project goals. In the construction industry, this means predicting what materials will be needed, making sure they arrive on time, managing inventory effectively, reducing waste, and coordinating material flow with project timelines to boost overall performance and minimize delays (Brutus & Chiyem, 2020). For a project to be successful, efficient materials management is key, involving various stakeholders like clients and architects to bring unique structures to life (Clough et al., 2000). Success here is measured by timely deliveries, effective stock management, sticking to schedules, and cutting down on waste (Sogaxa, 2022).

Prieto's (2021) thorough overview sheds light on the crucial planning and control elements needed for the timely and efficient procurement of materials and equipment in construction. Research on materials management in construction projects has consistently revealed challenges like improper handling, storage limitations, logistics inefficiencies, and delivery delays (Aibinu & Odeyinka, 2016; Abdul-Rahman et al., 2016). Even with various strategies such as Just-In-Time concepts and the adoption of Information and Communication Technologies (ICT), success stories are still few and far between (Banton, 2024; Poudel, 2022). Many projects still rely on manual tracking methods, which often lead to errors and inefficiencies, especially with paper-based reporting and manual handling (Hermans et al., 2012). The limited use of tracking technologies like RFID indicates a pressing need for automation to boost operational efficiency (Moon, et al., 2018). RFID holds great promise for improving data storage and integrating with project management systems, which could streamline the processes of materials tracking and management (Zulkifli, et al., 2016). Consequently, current research is honing in on how to leverage RFID to enhance on-site materials tracking, inventory management, and resource allocation, all with the goal of tackling the long-standing challenges in construction materials management.

Despite its critical importance, material management remains an overlooked area among construction practitioners and scholars, as noted by Ibrahim & Daniel, (2021). This emphasizes the need for increased attention and investment in optimizing material management practices to maximize project success. This collectively underscores the strategic significance of material management in construction projects and provides valuable insights into addressing its challenges and optimizing its effectiveness.

The Processes and practices in Material Management

The spectrum of materials management is a vital part of construction projects, covering essential processes like planning, procurement, handling, stock and waste control, and logistics (Kaur, 2016; Mat Jusoh, & Kasim, 2017). When done right, effective materials management creates a positive environment for handling materials on construction sites (Boom & Bucket, 2023). To truly grasp materials management, it’s important to explore key processes such as planning and demand estimation, procurement, logistics, handling, and stock and waste control. Together, these processes ensure that materials flow smoothly and are used efficiently, leading to successful projects and happy stakeholders.

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Effect of Material Management on Project Performance

The effect of material management on construction projects encompasses various dimensions that significantly influence project performance. Effective practices in material management play a pivotal role in ensuring the successful completion of projects, with notable impacts observed across environmental, economic, and performance-related domains (Albert, 2018).

Challenges and Constraints in Material Management

The management of materials in construction projects presents various challenges and constraints that affect project performance and productivity. These challenges can be classified into several categories, each with its unique set of issues and implications.

i. Information Technology Challenges: Effective material management relies heavily on accurate and timely information flow. Challenges in this area include ensuring accurate generation and conveyance of information, particularly regarding material quantity, location, and delivery schedules (Tunji-Olayeni, et. al., 2017). The implementation of computerized systems and technologies such as bar codes, RFID, and ICT can improve tracking, inventory control, and communication between stakeholders (Erlangga, et. al., 2022).

ii. Decision Modeling Challenges: Contractors face challenges in identifying qualified suppliers, determining material requirements, and coordinating procurement and delivery schedules. Decisions regarding supplier selection, order quantity, and delivery timing are critical for ensuring material availability and avoiding shortages or excess inventory (Ozturk, 2020).

iii. Implementation Management Challenges: Changes in processes, methods, and technologies can pose challenges for organizations adopting new material management practices. Resistance to change, lack of user-friendly software, and insufficient training in computer-based systems hinder the effective implementation of material management initiatives (Amarantou, et. al., 2018). Moreover, Construction delays can be caused by poor project planning and management (Khaled, 2019).

Technological Innovations in Material Management

Technological innovations in material management within the construction industry encompass various technologies, a few researchers have found technologies such as Building Information Modeling **(BIM)** and Radio Frequency Identification **(RFID)** have enhanced material management by streamlining procurement and inventory tracking (Zulkifli et al., 2021). While these technologies improve efficiency, their adoption remains limited in developing countries like Nigeria due to high costs and technological infrastructure gaps (Albert et al., 2022).

Empirical Review

Gurmu (2018) conducted a comprehensive investigation into construction materials management practices in multi-storey building projects within Victoria State, Australia. Employing a mixed-methods approach, the study involved qualitative data collection from experts and quantitative data collection from contractors. The primary objective was to identify and prioritize practices that could bolster labor productivity. Among the key findings were the sig Kuebutornye et al. (2018) delved into material management techniques crucial for construction firms in the Tamale Metropolis of Ghana. Utilizing questionnaires administered to 96 material management personnel, the study reflects several essential practices, including meticulous planning and monitoring of material schedules, fostering strong supplier relationships, implementing on-site security measures, leveraging information communication technology, and providing effective worker training. These practices were found to directly impact project delivery success.

Akinola et al. (2022) examined material management practices among manufacturing companies in southwestern Nigeria. Employing a descriptive survey research design, the study identified key practices such as production

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planning and control, distribution, warehouse and store management, and inventory management. These practices were shown to positively influence the financial performance of manufacturing firms.

Caldas et al. (2014) detailed a study aimed at delineating materials management techniques prevalent in the capital projects industry. Through surveys, interviews, and case studies involving 54 organizations, the research showcased a significant enhancement in the maturity, formality, and systematic approach to materials management. These improvements contributed to more predictable project outcomes, cost reduction, enhanced productivity, quality, and safety.

Albert et al. (2022) investigated the impact of materials management practices on building projects within the Nigerian construction industry. Utilizing questionnaires administered to construction site professionals, the study highlighted the positive outcomes associated with effective materials management, including reduced material costs, improved quality control, better field material control, on-site material storage optimization, productivity enhancements, and timely project completion.

Vatsal et al. (2017) conducted a review aimed at examining the influence of material management practices on the delivery of building construction projects. Employing a questionnaire survey, the study identified common root causes of ineffective material management and their correlation with project delivery issues such as cost overrun and delays. The research revealed the critical role of effective material management practices in mitigating project risks and ensuring timely delivery

Research Gap

Despite extensive studies on material management in the construction industry, there is a noticeable gap in localized research that specifically addresses the material management practices within the Nigerian real estate sector and their direct effects on project performance. Previous research often focuses on general practices and theoretical applications without a deep dive into the specific challenges and effectiveness of these strategies in the unique context of Nigeria's real estate development, specifically in the case of. Additionally, while the effect of material management on cost and time efficiency has been explored, less attention has been paid to how these practices affect overall project quality and stakeholder satisfaction in this region. This study aims to fill these gaps by providing targeted insights into the specific material management strategies employed in Abuja and evaluating their practical outcomes on project performance.

METHODOLOGY

This study adopts a mixed-methods approach, combining both qualitative and quantitative research techniques to explore material management practices in Akwa Ibom's real estate sector.

Sampling Size and Selection

The study targeted 20 key stakeholders involved in construction projects in Akwa Ibom, using purposive sampling. Participants such as project managers, procurement officers, site engineers, and suppliers, were selected for their direct involvement in material management. This sample size ensures a manageable and diverse representation of the real estate sector, providing a balanced perspective on material management strategies and challenges.

Data Collection Methods

Qualitative Data: Semi-structured interviews was conducted with stakeholders to gain in-depth insights into their experiences with material management. Each interview lasted 15–20 minutes, ensuring a focused discussion on key strategies, challenges, and their impact on project performance. Interviews was audio-recorded and transcribed for analysis.

Quantitative Data:

Procurement documents, inventory records, and project performance data (e.g., project completion times, cost reports, material waste records) was reviewed to assess material usage, cost efficiency, and project outcomes.

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Data Analysis

Qualitative Analysis: Thematic analysis was used to identify and categorize key themes from the interview data, such as material management strategies, challenges, and their effects on project performance.

Quantitative Analysis:

Data were analyzed using SPSS for statistical analysis, including regression analysis and descriptive statistics to evaluate the relationship between material management strategies and project performance (cost, time, quality).

Ethical Considerations

Informed consent was obtained from all participants. They were informed about the study's purpose, their role, and the confidentiality of their responses. Interviews was conducted in accordance with ethical research standards.

RESULTS

Table 1: Descriptive Statistics of Material Management Strategies

This table summarize key metrics for each strategy, showing how each performs across multiple dimensions (e.g., cost efficiency, time efficiency, quality).

Material Management Strategy	Cost Efficiency (%)	Time Efficiency (%)	Quality Performance (%)
Just-in-Time Delivery	75	80	85%
Vendor-Managed Inventory	65	70	78%
RFID Integration	80	82	90%
Manual Inventory Tracking	40	45	50%

Source: Author's analysis, 2026. Based on interviews with 20 stakeholders in Akwa Ibom's real estate sector.

Figure 1: Material Management Strategies in Akwa Ibom's Real Estate Sector

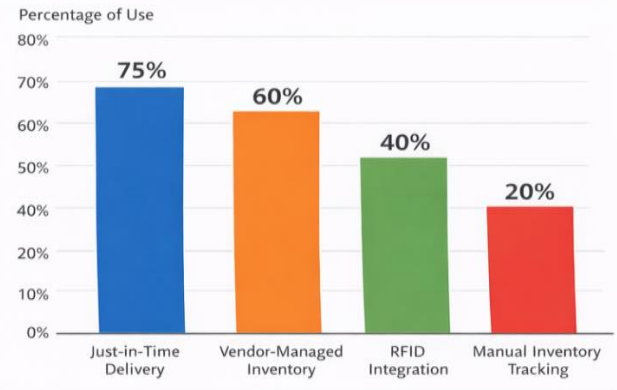

Figure 1: Material Management Strategies in Akwa Ibom's Real Estate Sector.

Source: Author's analysis, 2026. Strategies and challenges in Akwa Ibom's real estate

Figure 2: Challenges in Material Management in Akwa Ibom

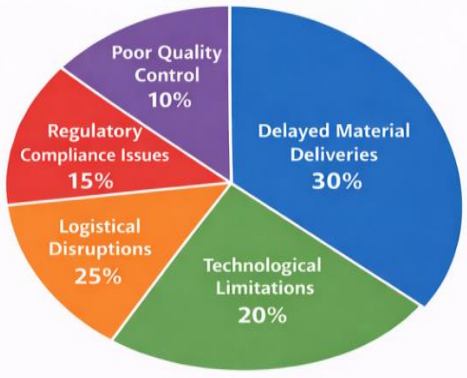

Figure 2: Challenges in Material Management in Akwa Ibom.

Source: Author's analysis, 2026. Strategies and challenges in Akwa Ibom's real estate sector.

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Table 2: Challenges in Material Management Reported by Stakeholders

This table categorize the challenges identified by the stakeholders, indicating how frequently each was reported (e.g., percentage of participants reporting each challenge).

Challenge	**Frequency (n=20)**	**Percentage (%)**
Logistical Disruptions	15	75
Technological Limitations	12	60
Regulatory Compliance Issues	10	50
Poor Quality Control	8	40
Delayed Material Deliveries	18	90

Source: Author's analysis, 2026. Based on interviews with 20 stakeholders in Akwa Ibom's real estate sector.

Table 3: Regression Analysis of Material Management Strategies and Project Performance

This present the statistical relationship between strategies and project performance (cost, time, quality).

Material Management Strategy	**Cost Efficiency (β)**	**Time Efficiency (β)**	**Quality Performance (β))**
Just-in-Time Delivery	0.45	0.38	0.45
Vendor-Managed Inventory	0.32	0.42	0.36
RFID Integration	0.50	0.44	0.49
Manual Inventory Tracking	-0.10	-0.12	-0.08

Source: Author's analysis, 2026. Based on regression analysis of procurement data and stakeholder interviews.

Table 4: Interview Participant Demographics

This could provide a snapshot of the participants involved in the study, enhancing the transparency of your qualitative research.

Participant Role	**Number of Participants**	**Years of Experience (Avg.)**	**Involvement in Material Management (%)**
Project Manager	5	12	90%
Procurement Officer	5	10	85%
Site Engineer	5	8	70%
Supplier	5	7	75%

Source: Author's analysis, 2026. Based on findings from interviews with stakeholders and data analysis.

Analysis: The recommendations emphasize adopting **advanced technologies** like **RFID and BIM**, which can significantly improve material tracking and efficiency. **Just-in-time delivery** is also highly recommended due

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to its potential to reduce costs and project delays. Training programs and stakeholder collaboration are also critical for optimizing material management practices in Akwa Ibom's real estate sector.

CONCLUSION

This study has provided valuable insights into the material management strategies employed in Akwa Ibom's real estate sector and their impact on construction project performance. The findings of this research highlight the critical role that effective material management plays in the successful completion of construction projects, with a emphasis on cost, time, and quality outcomes.

Key findings from this study include:

1. **Material Management Strategies:** The most commonly used material management strategies in Akwa Ibom's real estate sector are Just-in-Time Delivery, Vendor-Managed Inventory, and RFID Integration, with manual inventory tracking being the least used. These strategies, when implemented effectively, help reduce costs, improve project timelines, and enhance overall project quality.

2. **Challenges in Material Management:** The study identified several key challenges affecting material management in the region, including logistical disruptions, technological limitations, and delayed material deliveries. These challenges have a significant impact on the efficiency of material management practices and ultimately affect the success of construction projects.

3. **Effectiveness of Strategies**: RFID integration and Just-in-Time Delivery have shown a strong positive correlation with improved cost efficiency, time efficiency, and quality performance. These findings suggest that adopting modern technologies and refining material management practices can significantly enhance project outcomes. Conversely, traditional methods, such as manual inventory tracking, have a negative impact on all three performance indicators.

4. **Recommendations:** Based on the findings, several recommendations have been proposed to improve material management in Akwa Ibom's real estate sector:

Adoption of Advanced Technologies: The integration of RFID and BIM can streamline material tracking, minimize delays, and reduce waste. Although the adoption of these technologies in Nigeria has been slow, their potential to improve project outcomes is substantial.

Implementation of Just-in-Time Delivery: This strategy should be promoted to reduce inventory costs and improve material flow on construction sites.

Fostering Stakeholder Collaboration: Enhanced communication and collaboration among project stakeholders can help mitigate logistical challenges and improve project coordination.

Training and Education: Investing in targeted training programs for professionals in the industry can help improve understanding and adoption of best material management practices.

Practical Implications

The recommendations from this study are practical and can be directly applied by stakeholders in Akwa Ibom's real estate sector. Implementing these strategies could lead to more cost-effective, timely, and high-quality construction projects, thereby enhancing the region's overall real estate development. By addressing the identified challenges and leveraging technological innovations, the sector can overcome existing limitations and improve its competitive edge in the Nigerian construction industry.

Contributions to the Field

This research contributes to the growing body of knowledge on material management in the construction sector, specifically within the context of Nigerian real estate development. While material management has been widely

studied in other parts of the world, the local context of Akwa Ibom presents unique challenges and opportunities that have not been thoroughly explored. The study provides empirical evidence and practical insights that can guide future research and development in this area, particularly in developing countries.

Future Research Directions

Further studies should explore the long-term impacts of adopting advanced technologies such as RFID and BIM in Nigeria's construction sector, examining the cost-benefit analysis and the barriers to wider adoption. Additionally, future research could explore the regulatory framework and policy interventions needed to support the integration of these technologies in the Nigerian construction industry.

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