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Impact Of Construction Logistics and Supply Chain Risk Factors on Cost Performance in Nigeria

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Abstract- ***This study examines the influence of construction logistics and supply chain risk factors on cost performance in building construction projects in Nigeria. A quantitative research design was adopted, with data collected from 156 construction professionals comprising engineers, quantity surveyors, architects, and project managers. The study employed weighted mean analysis, Principal Component Analysis (PCA), and multiple regression analysis to evaluate logistics risk dimensions and their relationship with project cost performance.Findings indicate that construction professionals predominantly rely on intuition and experience-based decision-making, while the use of advanced analytical tools such as Monte Carlo simulation and Bayesian methods remains limited. The PCA identified five key risk dimensions: strategic planning and design risks, socio-institutional logistics risks, contractor capacity constraints, project governance risks, and policy/economic change risks. Regression results revealed that socio-institutional logistics risks have a statistically significant impact on project cost performance.The study concludes that weak logistics coordination, inadequate stakeholder management, and limited adoption of data-driven risk analysis tools are major contributors to cost overruns in Nigerian construction projects. It recommends improved logistics planning, strengthened stakeholder coordination, and increased integration of digital and analytical supply chain risk management systems.***

Keywords: Construction Logistics, Cost Performance, Nigeria, Risk Management, Supply Chain Risk

I. INTRODUCTION

The construction industry is a key driver of economic growth through infrastructure development, urbanization, and industrial expansion. However, it is widely characterized by persistent inefficiencies such as cost overruns, delays, and project failures, which continue to undermine project performance globally (Flyvbjerg, 2014; Doloi, 2013; Olawale & Sun, 2010).

These challenges are particularly severe in developing economies where institutional weaknesses and fragmented delivery systems affect project execution outcomes (Azhar et al., 2008).

Construction cost performance is strongly influenced by logistics and supply chain processes, which govern the flow of materials, labour, equipment, and information across project phases. Inefficiencies in procurement, transportation, inventory management, and stakeholder coordination frequently result in

project disruptions and cost escalation (Vrijhoef & Koskela, 2000).

Construction supply chains are increasingly exposed to risks arising from transportation delays, procurement uncertainty, supplier unreliability, and market volatility (Tang, 2006). In developing countries such as Nigeria, these issues are intensified by weak infrastructure, poor procurement systems, and limited integration among project participants (Akintoye et al., 2000; Ofori, 2015).

From a theoretical standpoint, Supply Chain Risk Management (SCRM) provides a framework for identifying and mitigating uncertainties within construction supply chains (Jüttner et al., 2003; Christopher & Peck, 2004).

In addition, Lean Construction theory emphasizes the reduction of waste and improvement of workflow efficiency, while the Resource-Based View (RBV) highlights the importance of organizational capability in achieving performance outcomes (Koskela, 1992; Barney, 1991).

Lean scholars have further argued that improved workflow reliability and waste minimization are essential for project success (Ballard & Howell, 2003; Shah & Ward, 2007). Despite these theoretical developments, many construction firms in developing economies still rely on experience-based decision-making rather than structured analytical approaches, limiting effective risk control.

Although previous studies have examined construction risks and project performance in different contexts (Zou et al., 2007; Eybpoosh et al., 2011; Oke et al., 2017), limited attention has been given to the combined effect of construction logistics and supply chain risk factors on project cost performance, particularly within the Nigerian construction context.
This represents a significant research gap in understanding how logistics-related uncertainties translate into cost overruns in developing economies.

Therefore, this study investigates the influence of construction logistics and supply chain risk factors on cost performance in building construction projects in Nigeria. It employs Principal Component Analysis (PCA) and regression modelling to identify key risk dimensions and evaluate their impact on project cost outcomes.

The study contributes to integrating logistics, supply chain risk management, and project performance theory in explaining cost performance in construction projects.

II. LITERATURE REVIEW

Construction industry is one of the key sectors of the economy since it provides the physical infrastructure needed for industrialization, urban development and social welfare. Construction plays an important role in the growth of national gross domestic product (GDP), employment, and investments in both developed and developing countries.

Despite its strategic importance, the industry is still facing persistent problems of cost overruns, schedule delays, loss of productivity and project failures, which have a negative impact on project performance and the satisfaction of stakeholders (Flyvbjerg, 2014; Doloi, 2013).

Cost performance is one of the main indicators of project performance as it directly affects the profitability of project, the investment returns, competitiveness of the organization and long-term sustainability.

Construction projects are set in a very uncertain and risk-filled environment, where technical challenges, economic uncertainties, stakeholder interactions, regulatory restrictions, and disruption of operations all play a part. These uncertainties can pose many risks to the projects that could impact the project's goals, and they may also lead to higher project costs (Project Management Institute [PMI], 2021).

Construction logistics and supply chain management have grown in importance as important factors impacting project performance over the past few years. Construction logistics includes the management of resources and materials, including planning, coordination, movement, storage, and

control of materials, equipment, labor and information throughout the project lifecycle.

An effective logistics management guarantees that the necessary resources are delivered in the required amount, at the appropriate time and place, which helps to reduce waste and improve the efficiency of the project (Sobotka & Czarnigowska, 2005).

Building supply chain management, on the other hand, involves coordinated integration between client, contractor, subcontractors, suppliers, consultants and regulatory bodies in the building industry to enhance the coordination of the building process and the project results (Vrijhoef & Koskela, 2000).

With the growing complexity in the world of modern construction projects, the role of logistics and the integration of supply chains has grown in importance as well. The risks that come from procurement uncertainties, supplier failures, transportation disruptions, market volatility, information asymmetry and stakeholder conflicts are specific to construction supply chains (Christopher & Peck, 2004; Tang, 2006).

These risks can cause material flows to be interrupted, project activities to be delayed, productivity to be affected and major project cost overruns. However, these challenges are more pronounced in developing economies like Nigeria, where the infrastructure systems are not robust, inflationary pressures, weak procurement systems, logistics networks and institutional inefficiencies create further vulnerabilities within construction supply chain.

As a result, construction projects often fail to finish on time, budget, and even sometimes fail to get completed at all. Their frequent occurrence underscores the importance of improving the understanding of the impact of logistics and supply chain (SC) risks on the performance of project costs in the context of the construction industry in Nigeria.

While project risk management, construction supply chain management and project performance have been studied separately, few studies have explored the impact of logistics and supply chain risk factors on construction cost performance based on complex quantitative analysis.

Hence, the present literature review explores theoretical and empirical basis of construction project cost performance, construction logistics, supply chain management, construction project risk management, and construction logistics related risk factors influencing to the project cost performance in construction projects.

Construction Project Cost Performance

Some of the most common measures of the success of any construction project is cost performance. It quantifies the degree of completion of a project that meets the technical specifications, functional requirements and stakeholder expectations, and is finished within the approved budget. Good cost performance indicates efficient use of project resources, and is a key component of the profitability of the organization, satisfaction of the client, and sustainability of the project (Flyvbjerg, 2014).

There are many uncertainties that are inherent in a construction project that can have an impact on the result of costs. These uncertainties are caused by the inability to accurately estimate the costs of design, inflation, price changes for materials, labour shortages, productivity differences, changes in design, procurement delays, and unexpected site conditions. If these elements are not managed well, actual cost of the project can be higher than the plan, leading to cost overruns and project underperformance (Doloi, 2013).

Overrun costs are a regular issue in the construction sector around the world. Flyvbjerg (2014) noted that cost escalation is common to developed and developing economies, and is primarily associated with underestimation of the risks at the planning stage. Likewise, love et al. (2013) suggested that cost overrun is not a single reason but rather, it is the combination of technical, managerial, organizational and supply chain risks during the project life cycle.

Recent studies have highlighted the importance of Construction Logistics and Supply Chain Management (CSCM) in delivering construction

projects efficiently, by cutting down on procurement time, cutting inventory costs, improving communication, and making workflow more reliable.

Moreover, digital transformation and integrated supply chain systems have enabled enhanced coordination in these disjointed construction networks and increased visibility, traceability and operational efficiency.

The benefits of these developments have been linked to better cost performance and lower uncertainties in projects in complex construction environments (Hosseini et al., 2021; Durdyev et al., 2022; Ivanov & Dolgui, 2020).

The correct cost estimation of the project is an essential basis for achieving satisfactory cost performance. Conventional estimation methods often involve making assumptions that do not fully account for the uncertainties inherent in construction projects. As a result, researchers have proposed the use of risk analysis in the cost estimation process to fine-tune forecasts to better support decision-making (Flanagan & Norman, 2007).

Risk-adjusted estimating methods allow project teams to adjust for potentially different assumptions and make their project estimates more reliable. Good project planning, monitoring and control are also necessary to ensure satisfactory cost performance.

The Project Management Institute (PMI, 2021) defines project cost management as the process of estimating, budgeting, financing, monitoring and controlling costs during the life of the project. By monitoring continuously, project managers can detect any deviation from the budget, take corrective measures and reduce the effect of new risks on the budget of the project.

Macroeconomic instability, poor infrastructure, weak institutional frameworks and divided project delivery systems are factors that make it difficult to achieve satisfactory cost performance in developing economies like Nigeria.

The conditions create the risk of procurement issues, logistics issues and conflicts with stakeholders that all impact project costs. Therefore, it is still needed to know what affects construction cost performance in order to gain better project delivery results and better competitive performance of construction enterprises.

Construction Logistics and Supply Chain Management

Construction logistics and supply chain management (CSCM) has emerged as a critical area of research due to its influence on project efficiency, productivity, and cost performance.

Construction logistics refers to the planning, implementation, and control of the movement and storage of materials, equipment, labour, and information required for project execution. Effective logistics management ensures that resources are delivered in the right quantity, at the right location, and at the right time, thereby reducing waste and enhancing project performance.

Unlike manufacturing supply chains, construction supply chains are temporary, fragmented, and project-based, involving multiple independent actors such as clients, contractors, subcontractors, suppliers, consultants, and regulatory agencies. These characteristics make coordination and information sharing particularly challenging.

According to Vrijhoef and Koskela (2000), construction supply chain management extends beyond material procurement to include the integration of activities and stakeholders across the project lifecycle.

They identified four major roles of supply chain management in construction: improving site operations, reducing supply chain costs, transferring activities from the construction site to the supply chain, and achieving integrated supply chain management.

Recent studies have emphasized that effective CSCM improves project delivery by reducing procurement delays, minimizing inventory costs, improving communication, and enhancing workflow reliability.

The growing adoption of digital technologies such as Building Information Modelling (BIM), Internet of

Things (IoT), and digital procurement systems has further strengthened supply chain visibility and coordination.

Digital integration within construction supply chains enhances logistics transparency, improves material tracking, and reduces coordination errors across project participants, thereby improving project performance and reducing cost overruns in complex construction environments (Hosseini et al., 2021; Durdyev et al., 2022).

In addition, supply chain resilience has become a key focus area, with evidence showing that firms with stronger adaptive logistics capabilities are better able to manage disruptions arising from market volatility, supplier uncertainty, and infrastructural constraints (Ivanov & Dolgui, 2020).

Construction Risk Management

Construction projects operate in uncertain environments characterized by technical, economic, environmental, political, and organizational risks. Project risk management involves the systematic process of identifying, assessing, responding to, and monitoring risks that may affect project objectives.

According to the Project Management Institute (PMI), risk management is an integral component of project governance and performance management. The PMBOK Guide emphasizes proactive identification and treatment of project uncertainties to improve project outcomes.

Construction risk management has evolved from traditional reactive approaches toward more proactive and analytical techniques that support informed decision-making throughout project execution.

Logistics and Supply Chain Risk Factors in Construction Projects

Logistics and supply chain risks refer to uncertainties that disrupt the flow of materials, equipment, information, and services across the construction supply chain. These risks typically arise from procurement delays, supplier failures, transportation disruptions, inadequate infrastructure, labour shortages, stakeholder conflicts, regulatory changes, and macroeconomic instability.

In developing countries, these risks are further intensified by weak transportation networks, inefficient procurement systems, and institutional constraints that undermine coordination among project participants. Such disruptions negatively affect material availability, construction sequencing, workforce productivity, and overall project cost performance.

Empirical evidence consistently shows that fragmentation within construction supply chains, coupled with weak stakeholder integration, is a major driver of inefficiency and cost escalation in construction projects. For example, Akintoye et al. (2000) highlight that limited collaboration and poor procurement integration significantly increase uncertainty and project delivery risks.

Similarly, Dubois and Gadde (2002) argue that the construction industry operates as a loosely coupled system, where poor coordination among actors leads to inefficiencies in resource flow and project execution. In addition, Love et al. (2013) demonstrate that supply chain inefficiencies are closely associated with rework, delays, and cost overruns in infrastructure projects.

Theoretical Foundation

Supply Chain Risk Management (SCRM) Theory

Supply Chain Risk Management (SCRM) Theory explains how organizations identify, assess, and mitigate risks that threaten supply chain performance.

The theory argues that supply chains are increasingly vulnerable to disruptions arising from internal and external uncertainties. Effective risk management enhances resilience and improves operational performance (Jüttner et al., 2003; Christopher & Peck, 2004).

Lean Construction Theory

Lean Construction focuses on eliminating waste and improving workflow efficiency throughout project delivery. According to Koskela (1992), waste occurs when resources are consumed without adding value to the final product. Delays, rework, excessive inventories, transportation inefficiencies, and poor

coordination represent forms of waste that directly influence project costs.

Resource Based View (RBV)

The Resource-Based View argues that organizational performance depends on valuable, rare, inimitable, and non-substitutable resources. In construction, capabilities such as logistics planning, procurement management, digital systems, and risk management competence constitute strategic resources that influence project performance.

Empirical Review

Previous empirical studies have consistently demonstrated the influence of logistics and supply chain management on construction project performance.

Vrijhoef and Koskela (2000) reported that fragmented supply chains contribute significantly to inefficiencies and waste within construction projects. Akintoye et al. (2000) found that fragmented procurement systems increase uncertainty and contribute to cost escalation in construction projects. Love et al. (2013) observed that supply chain inefficiencies frequently result in delays, rework, and cost overruns.

Flyvbjerg (2014) provided extensive evidence showing that cost overruns remain a global phenomenon largely attributable to inadequate risk assessment and optimism bias during project planning.

Although these studies provide valuable insights, limited empirical research has integrated logistics risk factors, supply chain management variables, and project cost performance within a single analytical framework using advanced multivariate techniques such as Principal Component Analysis (PCA) and regression modelling, particularly within the Nigerian construction context.

Research Gap

The review reveals three major gaps:

1. Existing studies often examine project risk management and cost performance separately without explicitly focusing on logistics and supply chain risks.
2. Empirical evidence from developing economies, particularly Nigeria, remains limited.
3. Few studies have employed advanced multivariate techniques to identify underlying logistics risk dimensions and evaluate their influence on project cost performance.

The present study addresses these gaps by investigating the effect of construction logistics and supply chain risk factors on project cost performance using Principal Component Analysis and regression modelling.

III. METHODOLOGY

A quantitative survey research design was adopted to examine the effect of construction logistics and supply chain risk factors on project cost performance in Nigeria. A cross-sectional field survey was conducted among construction professionals involved in project delivery in Imo State, Nigeria. The design is appropriate as it enables empirical testing of relationships between logistics-related risk variables and cost performance using statistical techniques.

Primary data were collected through a structured questionnaire administered to professionals including engineers, quantity surveyors, architects, project managers, and procurement officers across selected construction projects. Secondary data were obtained from relevant journal articles, textbooks, and industry reports to support the study framework.

The study population comprised construction professionals involved in 26 purposively selected building and infrastructure projects across Imo State. Purposive sampling was used to ensure only respondents with direct experience in logistics, procurement, and supply chain operations were included.

Data were analyzed using descriptive and inferential statistics. Weighted mean analysis was used to rank logistics and supply chain risk factors. Principal Component Analysis (PCA) was employed to reduce observed variables into key risk dimensions, while multiple regression analysis was used to assess the effect of extracted components on project cost performance.

The questionnaire was structured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Validity was ensured through expert review, while reliability was supported through pilot testing. Ethical considerations were observed by ensuring voluntary participation and confidentiality of responses.

IV. RESULTS

This section presents the empirical findings from data collected from 156 construction professionals involved in project delivery in Nigeria. The analysis focuses on the influence of construction logistics and supply chain risk factors on project cost performance using descriptive statistics, Principal Component Analysis (PCA), and multiple regression analysis.

Table 4.1: Questionnaire Distribution and Response Rate

Questionnaire Status	Frequency	Percentage (%)
Questionnaires Distributed	165	100
Questionnaires Returned	160	96.9
Valid Questionnaires Used for Analysis	156	94.
Invalid/Incomplete Questionnaires	4	2.4
Non-Returned Questionnaires	5	3.0
Total	165	100.00

Source: Field Survey, 2026.

Table 4.2: Gender Distribution

Gender	Frequency	Percentage
Male	101	64.7
Female	55	35.3
Total	156	100

Source: Field Survey, 2026

Table 4.3: Educational Qualification

Qualification	Frequency	Percentage (%)
HND/B.Sc	78	50.0
M.Sc/M.Tech	52	33.3
PhD	18	11.5
Others	8	5.2
Total	156	100

Source: Field Survey, 2026

Table 4.4: Distribution of Respondents by Years of Experience

Years of Experience	Frequency	Percentage (%)
0–5 Years	77	49.4
6–10 Years	55	35.3
11–20 Years	15	9.6
21–30 Years	7	4.4
Above 30 Years	2	1.3
Total	156	100

Source: Field Survey, 2026

Table 4.5: Distribution of Respondents by Profession

Profession	Frequency	Percentage
Engineer	45	28.8
Quantity Surveyor	32	20.5
Architect	28	17.9
Builder	21	13.5
Project Manager	18	11.5
Procurement Officer	12	7.7
Total	156	100

Source: Field Survey, 2026

A total of 165 questionnaires were distributed, of which 160 were returned and 156 were valid for analysis, representing a response rate of 94.5%. This is considered adequate for multivariate statistical analysis.

The demographic results show that respondents were predominantly male (64.7%) and well qualified, with 50% holding HND/B.Sc degrees and 44.8% possessing postgraduate qualifications. In terms of experience, 50.6% had more than six years of professional experience, indicating adequate industry knowledge. The sample also covered key professional groups including engineers (28.8%), quantity surveyors (20.5%), and architects (17.9%).

Table 4.6: Ranking of Construction Logistics and Supply Chain Risk Management Techniques

Risk Management Techniques	Weighted Mean	Ranking
Intuition/Judgment/Experience	4.74	1
Subjective Probability	3.84	2
Sensitivity Analysis	3.58	3

Risk Premium	3.47	4
Decision Analysis	3.42	5
Risk Adjusted Discount Rate	2.95	6
Monte Carlo Simulation	2.32	7
Algorithms	2.26	8
Mean Analysis	2.26	9
Bayesian Theory	1.84	10
Stochastic Dominance	1.68	11
Casper Technique	1.42	12

Descriptive Results: Risk Management Practices
Findings show that construction professionals in Nigeria rely heavily on intuition and experience-based decision-making (mean = 4.74). Advanced analytical tools such as Monte Carlo simulation (2.32) and Bayesian methods (1.84) are rarely used.

This indicates a low level of digital and quantitative risk management adoption in construction logistics and supply chain practices.

Table 4.7: Table 4.5 KMO and Bartlett's Test

Test	Value
KMO Measure of Sampling Adequacy	0.812
Bartlett's Test Chi-Square	586.427
df	45
Sig.	0.000

Table 4.8: Total Variance Explained by Principal Components

Component	Eigenvalue	Percentage Variance Explained	Cumulative Percentage
PC1	4.465	27.906	27.906
PC2	2.913	18.206	46.112
PC3	2.006	12.540	58.651
PC4	1.956	12.225	70.877
PC5	1.364	8.528	79.404

Table 4.9: Rotated Component Matrix

Variable	PC1	PC2	PC3	PC4	PC5
Procurement Delays	0.812				
Design Changes	0.776				
Stakeholder Conflict		0.841			
Regulatory Delays	0.795				
Contractor Financing		0.834			
Labour Shortage		0.782			
Weak Supervision			0.804		
Poor Monitoring			0.748		
Policy Changes				0.812	
Inflation				0.744	

Principal Component Analysis (PCA) Results
Table 4.7 presents the Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity results. The KMO value of 0.812 exceeds the minimum threshold of 0.60, indicating sampling adequacy for factor analysis. Bartlett's test was statistically significant ($p < 0.05$), confirming sufficient correlations among variables.

Table 4.8 shows that five principal components were extracted, explaining 79.4% of the total variance in the dataset. This indicates that the identified factors adequately represent the underlying structure of construction logistics and supply chain risks.

Table 4.9 presents the rotated component matrix, which confirms strong factor loadings (>0.70) across variables, indicating good construct validity and clear factor separation.

The extracted components were interpreted as:

i. Strategic planning and design risks
ii. Socio-institutional logistics risks
iii. Contractor capacity constraints
iv. Project governance risks
v. Policy and economic risks

Table 4.10: Regression Summary for Cost Performance Model

Variable	Coefficient (B)	t-value	Significance
PC2	-0.184	-2.30	0.033
R	R^2	Adjusted	F-value

		R^2	
0.490	0.240	0.195	5.37

REGRESSION RESULTS

The regression analysis shows that socio-institutional logistics risk (PC2) has a statistically significant negative effect on project cost performance ($\beta = -0.184$, $t = -2.30$, $p = 0.033$). The model is significant ($F = 5.37$, $p < 0.05$) and explains 24% of the variation in cost performance ($R^2 = 0.240$; Adjusted $R^2 = 0.195$).

This indicates that increases in stakeholder conflicts, regulatory bottlenecks, and community disruptions are associated with higher project cost overruns. These factors primarily affect cost performance through disruptions in procurement flow, material delivery delays, and reduced coordination efficiency within the supply chain.

V. DISCUSSION

The results are congruent with the theory of Supply Chain Risk Management (SCRM) which suggests that risks from the supply chain due to external uncertainties have a significant impact on the performance of the supply chain (Christopher & Peck, 2004; Jüttner et al., 2003).

Socio-institutional instability raises vulnerability of procurement and logistics in the Nigerian construction setting which results in cost overruns. Similar findings have been reported by Love et al. (2013), who demonstrated that ineffective coordination and process inefficiencies contribute significantly to rework, delays, and cost overruns in construction projects.

Likewise, Dubois and Gadde (2002) argued that the fragmented nature of construction supply chains often leads to poor stakeholder integration and inefficient resource flows, thereby undermining project performance. These findings reinforce the view that institutional and stakeholder-related disruptions adversely affect project outcomes in developing economies.

The results suggest that systemic waste exists in the flow of materials, coordination and workflow management from a Lean Construction point of view. The inefficiencies noted (delays, re-work and idle resources) show poor process integration, which supports Koskela's theory on production in construction inefficiency (Koskela, 1992).

This is also affirmed by Salem et al. (2006), who suggested that poor workflow planning and ineffective material management are significant causes of waste generation and poor performance of projects.

Likewise, Mossman (2009) suggested that poor coordination with project stakeholders is another key constraint for achieving lean construction goals, which may lead to project delays and waste of resources as well as project cost overruns.

The Resource Based View (RBV) also sheds light on the results, as it implies that companies with less capability for logistics planning, digital tools and risk analytics are less capable of controlling the cost performance in the construction sector. This capability gap leads to a lack of structured decision systems.

The finding is consistent with the arguments of Wernerfelt (1984) and Grant (1991) who argued that the resources and capabilities of an organization are the bases for competitive advantage and operational effectiveness. In many cases, the firm encounters difficulties in obtaining better performance results, especially when working with complex projects, due to poor capabilities.

The results indicate that there is need to enhance logistics capability, improve coordination amongst stakeholders and introduce data-driven approach to managing construction risk to improve construction cost performance in Nigeria.

Resource-Based View (RBV)

These findings indicate that intuition and experience are the major factors that most construction professionals use rather than structured logistics and supply chain risk tools. This means that the company has limited digital logistics systems, data analysis, and formal risk management skills within itself, according to the Resource-Based View (Barney, 1991).

Logistics risks like procurement delays, transportation disruptions, and inventory inefficiencies have a significant impact on cost performance, especially in the context of this study. The results indicate however that it is found that many companies do not have the internal resources to transform logistics information into effective decision-making systems.

Persistent cost overruns on construction projects in Nigeria can be attributed to this capability gap, where companies are not able to create a competitive advantage in the logistics planning and cost control process that can last.This capability gap is what underlies the recurring cost overruns of construction companies in Nigeria, as they are not able to establish a lasting competitive edge in logistics planning and control.

The results confirm the view of Wernerfelt (1984) and Grant (1991) that the important factors for operational performance and competitive advantage are organizational capabilities and strategic resources.

Lean Construction

Construction theory is about avoiding waste and efficient flow in project delivery systems (Koskela, 1992). The results show that construction logistics processes in Nigeria are still considered inefficient in terms of delays in supplies of materials, lack of coordination in procurement, and undercoordinated scheduling of resources.

These inefficiencies produce various types of waste: waiting time, reworking, idle work and overstocking expenditure, which all have an impact on project costs.

The results also highlight the need for improved coordination of stakeholders which can exacerbate inefficiencies and work stoppages in the supply chains. The result indicates that the application of lean principles in the construction logistics and supply chain management (SCM) practices in Nigeria is still not effective.

The same was noted by Alarcón (1997) and Sacks et al. (2010) where they stated that lack of logistics integration reduces the impact of lean construction implementation.

Supply Chain Risk Management (SCRM)

The regression results show that socio-institutional logistics risks are the most important factor affecting cost performance. This is consistent with the theory of Supply Chain Risk Management, which states that Supply Chains are very sensitive to external risks and coordination problems (Christopher & Peck, 2004; Jüttner et al., 2003).

Stakeholder conflict, regulatory delays and community disruptions are major risks that directly impact procurement, transportation and site operations in the Nigerian construction industry. These interruptions cause uncertainty, material delays and add to the project overall cost.

However, other studies also found that disruptions in the supply chain and failures in supply chain coordination are significant factors that affect the deterioration in operational and financial performance, as reported by previous works of Manuj and Mentzer (2008) and Thun and Hoenig (2011).

The results indicate that logistics risk in the construction process is not only technical but also institutional and it needs to be enhanced with good governance, institutionalization of stakeholders and better regulation.

Integrated Interpretation of Findings

The results demonstrate that cost performance in Nigerian construction projects is shaped by the combined effect of:

i. weak internal capabilities (RBV)
ii. inefficient logistics processes and waste generation (Lean Construction)
iii. and external institutional disruptions (SCRM)

This indicates that construction logistics and supply chain risk factors operate as an interconnected system rather than independent variables. Therefore, cost overruns are not caused by a single factor but by the interaction of capability gaps, process inefficiencies, and institutional instability.

The regression analysis revealed that socio-institutional logistics risk (PC2) was the only statistically significant predictor of construction cost performance (B = -0.184, t = -2.30, p = 0.033). The negative coefficient indicates that an increase in socio-institutional logistics risks, such as stakeholder conflicts, regulatory delays, and weak coordination among project participants, is associated with a decline in project cost performance, resulting in higher cost overruns.

The regression model explained approximately 24% of the variation in construction cost performance (R^2 = 0.240; Adjusted R^2 = 0.195), indicating a moderate explanatory power. This suggests that although logistics and supply chain risks significantly influence project cost outcomes, other project-specific factors not captured in the model may also contribute to variations in cost performance.

The findings further imply that institutional and coordination-related logistics risks exert a stronger influence on construction cost performance than purely technical logistics risks within the Nigerian construction context.

VI. CONTRIBUTION

The paper makes a contribution to construction logistics and supply chain risk management literature by empirically establishing the critical dimensions of logistics risks that affect the cost performance of construction projects in Nigeria. It establishes a hierarchical taxonomy of five logistics risk types based on PCA and regression analysis and shows that socio-institutional logistics risks are significant factors influencing the cost overruns.

The study is an extension of SCRM, Lean Construction and RBV theories as it demonstrates that the inefficiency in logistics can be attributed to process failures as well as capability. It also offers one of the few empirical models based on the context of a developing economy, and gives practical guidance on how to enhance logistics coordination, procurement systems and cost management in construction projects.

VII. PRACTICAL IMPLICATIONS

The results indicate that a well-designed logistics plan and coordination in the supply chain are key to improving cost performance in construction projects. Communication delays and cost overruns are often caused by inefficiencies in communication between contractors, suppliers, consultants, clients and regulatory agencies.

Better procurement planning, transport scheduling, inventory management and supplier coordination can optimize material flow, minimize downtime and boost project delivery results. All this reinforces the importance of the integration of logistics management into the overall project management systems.

Furthermore, the research indicates that digital logistics systems and structured risk management can also benefit decision-making processes and provide greater visibility throughout the supply chain in construction. In addition, strengthening the coordination and communication between stakeholders is essential in order to decrease uncertainty and enhance cost control.

VIII. CONCLUSION

The effect of construction logistics and supply chain risk on cost performance in construction project in Nigeria has been investigated in this study. The results indicate that the risks associated with logistics and supply chains are significant in affecting the project cost results, and that socio-institutional risks in logistics are the most important factor in the determination of cost overruns.

The results show that construction practitioners continue to predominantly use intuition, their experience and their judgment to deal with logistics and supply chain risks, and that the use of structured analytical and digital tools remains low.

This is an indication of the immaturity of the construction industry in Nigeria in terms of analytical ability in construction logistics practice. The Principal Component Analysis revealed five key dimensions of logistics and supply chain risks:

strategic planning and design risks, socio-institutional logistics risks, contractor capacity and resource risks, project governance risks, and policy/economic risks.

All these factors together account for an important share of the variance in Project cost performance, thereby substantiating the multidimensionality of logistics-related risks.

The regression results also found that the socio-institutional logistics risks have a negatively significant effect on cost performance, this shows that conflicts among stakeholders, delays in regulations, and disturbances in community are among the major factors that lead to cost overruns.

The study finds that the lack of structured logistics and supply chain risk management practices is one of the major reasons for cost inefficiency in construction projects in Nigeria. To enhance cost performance, institutional coordination needs to be strengthened, contractor capability needs to be improved and logistics system needs to be promoted based on data.

IX. RECOMMENDATIONS

The study suggests that construction companies should implement more formal and integrated logistics and supply chain management processes, especially in purchasing, transportation, inventory management and coordination of stakeholders.

Construction firms need to incrementally move from experience-based decision making to data-driven and analytical methods for dealing with logistics and supply chain risks.

Digital tools and risk analytics systems are encouraged for use, to enhance forecasting, monitoring and proactive decision-making.

Moreover, institutional structures should be enhanced by further streamlining approval procedures, increasing transparency in procurement mechanisms, and eliminating administrative delays that drive up project costs, on the part of both government agencies and project clients.

In conclusion, fostering greater collaboration among project stakeholders is crucial for better coordination, fewer disruptions and effective delivery of construction projects in Nigeria being more efficient and cost effective.

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