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The Impact of Risk Management Strategies on Road Transportation Projects Performance in Lagos, Nigeria

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Abstract:
The persistent underperformance of road transportation projects in Lagos, Nigeria has led to reduced operational efficiency, poor project outcomes, and compromised safety. Although risk management frameworks are globally institutionalized, their implementation in Lagos remains fragmented and predominantly reactive. This study examines the relationship between risk management strategies and project performance outcome in Lagos, using a mixed-method approach. Quantitative data were collected from 197 key stakeholders, including contractors, consultants, engineers and community representatives. The findings highlight the lack of standardized risk management frameworks and scope deficiencies, limited stakeholder engagement, and low adoption of advanced technologies. To address these challenges, the study recommends the institutionalization of an enforceable risk governance framework and implementation of mandatory risk assessments for all road projects exceeding one billion naira. These measures will enhance transparency, accountability, and infrastructure performance in Lagos.

Keywords: Risk Management Strategies, Risk Governance, Infrastructure Project Performance, Road Transportation, Lagos, Nigeria.

JEL: H54, R42, H83, M12

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INTRODUCTION

Road transport plays a vital role in economic development, especially in the rapidly urbanizing cities were population growth challenges infrastructure capacity. In most developing countries, the transport infrastructure performance is undermined by poor planning, resource mismanagement, and political interference. This trend is evident in Lagos, the commercial hub and one of the fastest-growing cities in Africa. With over 20 million residents and a complex overstretched road network resulting in chronic issues related to the implementation and delivery of road infrastructure projects. These issues range

from cost escalations and delays to poor stakeholder satisfaction are increasingly linked to ineffective risk management practices.

Globally, the literature highlights that infrastructure projects are inherently vulnerable to layers of risks: technical, financial, environmental, political, and social. If not mitigated, these risks limit project success and undermine long-term sustainability. According to Rejda and McNamara (2017), risk management has four fundamental processes, which include identification, evaluation, mitigation, and monitoring, all of which must be integrated throughout the project lifecycle.

These frameworks, however, assume highly developed institutional capacities and developed project governance systems of which, it is not true in many aspects of sub-Saharan Africa. Despite the widespread recognition of these risks in Nigeria, the institutionalization of risk management in road projects remains weak. Previous studies (Aibinu & Jagboro, 2002; Omoregie & Radford, 2006) have focused more on the symptoms such as corruption, poor procurement practices, and contractor underperformance, could help mitigate the underlying causes of poor performance. Moreover, the gap exists between theoretical frameworks adopted from international contexts and realities of infrastructure delivery in Lagos due to informal governance, budget fluctuation, and exclusion of stakeholders. This study aims at bridging that gap. It examines risk management techniques applied to Lagos road infrastructure developments and how these strategies influence projects performance outcomes. This research is framed by established models such as risk cycle presented by Rejda and McNamara (2017), the performance evaluation frameworks by Chan and Chan (2004) with emphasis on time, cost, quality, and stakeholder satisfaction, and the stakeholder governance model developed by Osei-Kyei and Chan (2015). These frameworks are adopted to evaluate the existence and perceived impact of risk practices on the project outcomes within the unique governance context of Lagos.

This study contributes to existing knowledge in three major ways: first, it operationalizes established risk theories in a data-oriented assessment of real-world delivery of infrastructure in Lagos. Secondly, it combines both structured quantitative data with semi-structured interview insights to achieve a thorough understanding of stakeholder perception and institutional practices. Third, it identifies context-specific obstacles like political interference, financial volatility and corruption that limit the effectiveness of risk measures, providing practical implications for policymakers and infrastructure planners within similar settings. This study contributes empirical evidence by exploring the connection between risk management and project performance that offers insights regarding the structural and behavioral gap affecting infrastructure outcomes in a high-risk urban environment. The findings reveal the technical failures in existing practices as well as the institutional challenges, which contribute to persistent projects underperformance. Through this analysis, the study highlights the need to develop more localized, adaptive, and enforceable risk governance frameworks in urban infrastructure systems.

To bridge these gaps, this study examines five key research objectives

- To assess how risk management strategies are implemented in Lagos road infrastructure projects, with emphasis on policy, systems, operational gaps.
- To assess the effectiveness of risk identification, risk mitigation, risk monitoring, and stakeholder engagement throughout projects development phases.
- To assess the impact of risk management practices on project performance in terms of cost, time, quality, and stakeholder satisfaction.
- To propose context-specific recommendations for improving risk governance frameworks in Lagos road infrastructure delivery.

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1. LITERATURE REVIEW

1.1. Risk and Infrastructure Delivery

Risk is inherent in all infrastructure projects, especially in developing countries, institutional instability and limited technical capacity escalate project vulnerabilities. As Rejda and McNamara (2017) highlight, risk management implies a continuous cycle of identification, evaluation, mitigation, and monitoring. All the stages must be implemented systematically to avoid losses and improve performance outcomes. Nevertheless, in most sub-Saharan African contexts, this cycle tends to be fragmented or skipped leading to cost overruns, delays, and poor service delivery.
Globally, infrastructure risks are technical, environmental, political, financial, and social. Zou, Zhang, & Wang (2007) acknowledged the need for proactive (avoidance, mitigation) and reactive (transfer, contingency) strategies, noting that context-specific practice is also vital. Risk is not only an objective reality but also a subjective experience depending on institutional structures, stakeholder perceptions, and governance culture (Hillson & Murray-Webster, 2007).

1.2. Risk Identification and Assessment

Risk identification is the first and probably most essential step in risk governance. Effective identification helps project teams to foresee an issue and thus effectively manage resources (Rahman & Kumaraswamy, 2002). In the developed context, a wide range of tools, such as checklists, scenario analysis, and expert consultations, are applied. However, this process is ad hoc or disregarded in most Nigerian projects and is ad hoc in nature in most cases (Omoregie & Radford, 2006). This compromises the rest of the risk management process and undermines the chances of achieving key performance indicators.

1.3. Risk Mitigation and Monitoring Strategies

Mitigation strategies aim to minimize the chances or the impact of risk events occurrence, while monitoring ensures that newly arising risks are tracked and tackled until the conclusion of the project life cycle. According to Zou et al. (2007), the most effective risk strategies for infrastructure is early mitigation embedded into procurement, planning, and design. However, Aibinu and Jagboro (2002) concluded that, in Nigeria, risk monitoring tends to be reactive and intermittent. Projects lack real-time feedback mechanisms and decisions are always prompted by crisis response rather than data-informed foresight. Insurance and contractual clauses can help transfer financial and legal risks, but they are not widely adopted in most low- and middle-income countries due to weak legal enforcement structure and informal procurement systems (Akintoye & MacLeod, 1997). These difficulties prompt the need for governance-sensitive frameworks as opposed to universalized toolkits.

1.4. Performance Outcomes and Risk-Performance Linkages

The common dimensions used to measure project performance are costs, time, quality, and stakeholder satisfaction, and increasingly. Chan and Chan (2004) developed one of the most widely cited multidimensional models wherein upstream risk planning is linked with the downstream project success. Integrating risk evaluations into early decision-making stages tends to achieve better performance outcomes across budget, schedule and technical standard (El-Sayegh, 2008).
However, project performance failures continue to exist in Nigeria. Delays cost escalations, and stakeholders dissatisfaction are frequently reported but often linked to poor risk planning (Ololukoju, 2006). Thus, the gap in literature identifies the necessity for integrated studies that explicitly connect risk strategy design with performance outcomes in a given context.

1.5. Stakeholder Engagement and Institutional Risk

In addition to technical and financial risks, infrastructure projects in urban Africa encounter social and political risks, particularly in highly populated and politically volatile cities like Lagos. Osei-Kyei and Chan (2015) highlight that stakeholder engagement in planning and delivery is paramount to mitigating project resistance and enhancing sustainability. In Nigeria, however, engagement is often just symbolic or superficial causing conflict, protests, or non-compliance (Nwachukwu & Emoh, 2010). Variations in risk perception also exists between the stakeholders depending on professional role, experience, and proximity to the decision making (Hillson & Murray-Webster, 2007). Overlooking these differences can lead to mismatch priorities and implementation gaps. Poor consultation and community exclusion can also constitute risk factors.

1.6. Contextual GAPS in the Nigerian Literature

While existing Nigerian research explores infrastructure risk (Omoregie & Radford, 2006; Aibinu & Jagboro, 2002), few studies integrate a direct connection to performance outcomes through an integrated and theory-driven lens. Most concentrate on isolated factors such as poor funding, contractor failure with exclusion of integrated risk governance that could resolve these challenges systematically. There is also a limited empirical work on how stakeholders perceive and implement risk strategies in actual practice, especially within Lagos, a city of complex governance structures, severe infrastructural deficits, and a high-risk investments environment.

1.7. Synthesis and Research Positioning

This study highlights a clear gap between global and emerging best practices in risk management in and their implementation in Nigeria's infrastructural sector. While theoretical models exist, they are often misaligned with institutional realities in Lagos. Therefore, this study adopts three key frameworks; Rejda and McNamara (2017) for risk cycle; Chan and Chan (2004) for performance measurement; and Osei-Kyei and Chan (2015) for stakeholder engagement, to investigate risk management strategies implementation and their impact on project outcomes in Lagos road infrastructure.

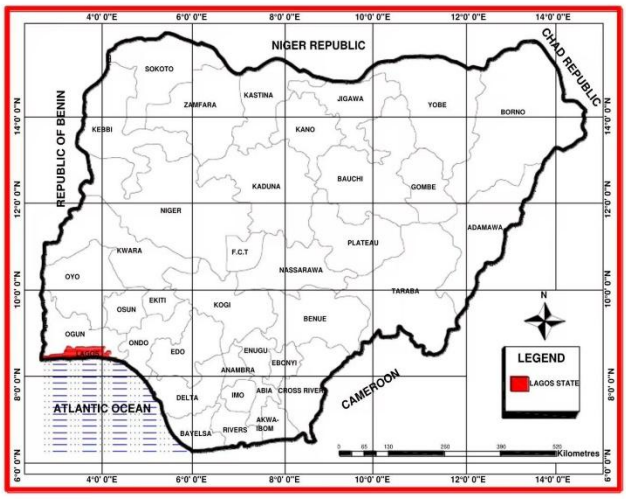

Figure 1. Map of Nigeria highlighting Lagos State.
Source: National Airspace Research and Development Agency NASRDA, 2012

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2. METHODOLOGY

This study employs a mixed-methods research design to explore the impact of risk management on the performance of road transportation infrastructure projects in Lagos, Nigeria. The combination of quantitative and qualitative approaches allows the study to record quantifiable implications associating risk variables, the outcome of projects, and generate contextual information regarding the practitioners and stakeholders working in the institutional environment of urban governance which is polycentric and complex in Lagos. Mixed-methods approach has been found beneficial to the study of infrastructures in the sense that it allows producing both generalizable information and robust analytical capacity; given the administrative and physical fragmentation of Lagos, its socio-environmental instability, and its lack of direct institutional control, such design is specifically appropriate to ascertaining the multilayered processes at the core of the infrastructure provision in the case under study. The quantitative component involved the distribution of standardized questionnaires to professionals involved in planning, implementing and controlling the road-infrastructure projects in Lagos. Foundational dimensions of risk management as captured by the survey instrument include the dimensions of risk identification, mitigation, monitoring and stakeholder engagement and the evaluation of its correlation to the organizational performance in terms of cost control, timely delivery, quality and stakeholder satisfaction.

A cross-section of stakeholders such as, civil engineers, project managers, regulatory officials, consultants, and community representatives were interviewed using semi-structured interviews. The qualitative component allowed for the interpretation socio-political and ecological factors that were marginal to the strictly quantitative evaluations most of the time. This study adopts a dual method approach in consistent with (Lucas, Philips, & Verlinghieri, 2022), who suggest a multi-modal approach to the study of the infrastructure system cannot be effective without combining technical data and contextual insights. In contrast to the structured and regulated frameworks examined in their studies. However, the Lagos environment lacks clearly defined jurisdictions, consistent policy application, and alignment between settlement demands and planning processes. These situations entail approach flexibility and necessitate a depth of context. These apprehensions are substantiated by empirical data of the study: 70% of the participants declared limited systematic processes of risk identification at the planning stage in the survey, and 76 participants affirmed no consistent risk-monitoring during project implementation. The previous research conducted by Dosumu (2022) emphasized the importance of involving experienced practitioner into risk management research, particularly in the context of high-risk/low-regulation. This study extends previous research and adopted the practical experiences of stakeholders affected by this risk that occurred in Lagos, providing insights into how risk is perceived, managed and disregarded in infrastructure delivery. Lagos was selected as the study area, due to its strategic economic significance, high rate of population growth and persisted infrastructure problems. Lagos population growth more than 20 million and an annual growth rate of more than 3% (Paul & McSharry, 2021), the city transportation network experiences daily pressure, making it a compelling case study for evaluating the effectiveness of risk management strategies. Given that infrastructure risk governance in megacities demands innovative and adaptive frameworks as observed by Renn, Klinke, & van Asselt (2018) observe, this study will offer frameworks to support the governance of infrastructure risk in megacities, as well as contribute to the previous research. However, cities like Lagos characterized by coastal vulnerability (Adelekan, 2016), a lack of coordinated governance, and unregulated land use.

The study by Emordi and Osiki (2008) provides empirical insight, which contributes context-specific insights that contradicts mainstream theoretical approaches to urban risk governance. The stakeholders were selected using a purposive sampling. These included professionals involved in infrastructure planning, implementation, and monitoring and community residents affected by completed or ongoing projects. This sampling strategy is methodological credible and experientially relevant, as it ensures the inclusion of diverse stakeholder perspectives, a vital element in

understanding risk management in urban infrastructure systems, as Dicks and Molenaar (2024) note, such understanding often emerges in context where governance asymmetry and local opposition are prevalent.

The quantitative component involved distributing 250 questionnaires. 197 valid responses were received yielding a response rate of 78.8%. Although no explicit statistical analysis was used to determine the sample size, the response rate is accepted for exploratory studies in complex urban environments, such as Lagos (Dosumu, 2022; Lucas et al., 2022). The survey instrument was adapted from previous studies, reviewed by two experts and pre-tested for content validity. While reliability statistics were not computed, internal consistency and relevance were achieved.

Table 1. Targeted Population

Total Distributed	Total Valid Responses Received	Percentages of Total Responses Received
250	197	78.8%

Source: Authors, Data obtained from Questionnaire, 2025

2.1. Data Collection Method

This study used structured questionnaires and semi-structured interviews to collect quantitative and qualitative data types. The questionnaires employed closed-end Likert scale questions to assess the risk identification, risk management strategies and performance outcomes across selected projects. The interviews used open-ended questions and follow-ups to explore deeper contextual and institutional insights from stakeholders.

2.2. Research Instruments

The questionnaire used a Likert scale to analyse the response which include 4 sections. The instrument was structured to measure the risk identification and assessments, risk effectiveness and strategies and performance outcomes indicators. The Likert scale responses range from 'Strongly Disagree' to 'Strong Agree'.

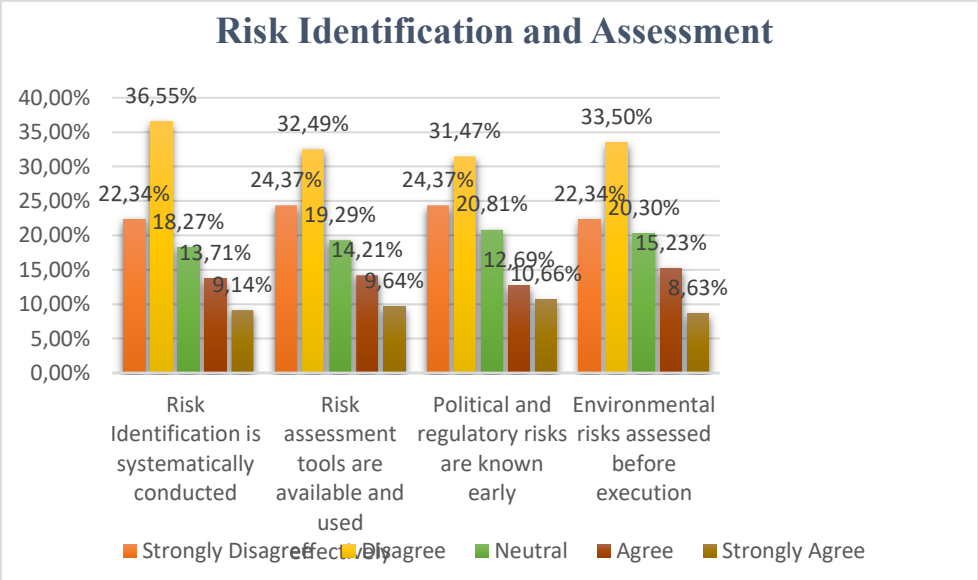

Figure 2. Risk Identification and Assessment

Source: Authors, Data obtained from Questionnaire, 2025

As shown in Figure 3, majority of the respondents (58.9%) disagreed (36.5%) or strongly disagreed (22.3%) that risk identification is systematically conducted on Lagos road projects. Similarly, 55.8% disagreed with the fact that all political and regulatory risks are addressed at initial phase, and 55.8% indicated that environmental risks are not properly evaluated prior to implementation. These results validate the hypotheses, as theorized by Rejda and McNamara (2017), that there's a lack of formalized risk planning structures. The first objective of this study to evaluate the gaps in the existing risk management strategies is clearly validated by the empirical perception that underlying risk identification processes are either weak or absent.

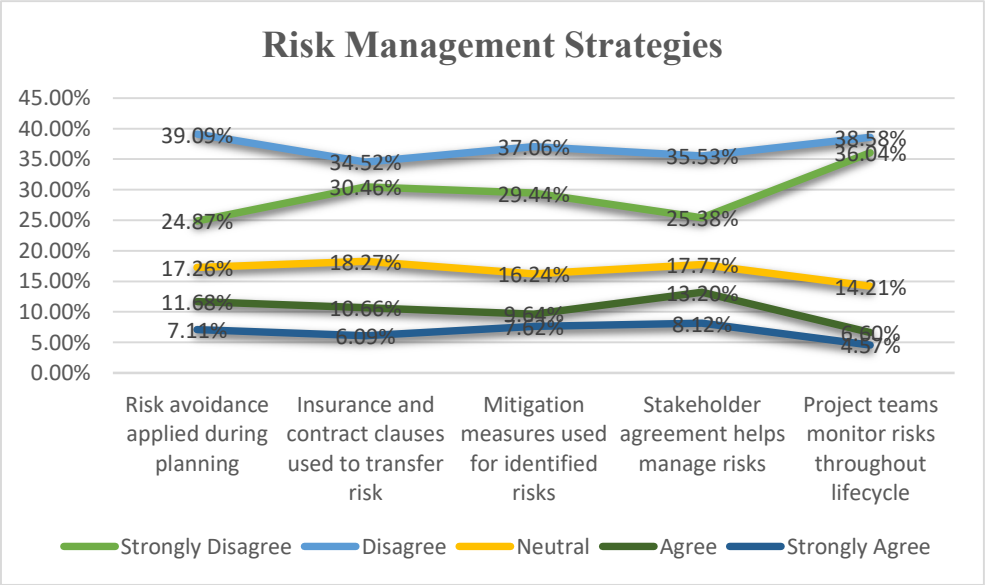

Figure 3. Risk Management Strategies
Source: Authors, Data obtained from Questionnaire, 2025

These findings (see Figure 4) the implementation of risk management strategies was rated poorly. 18.8% either agreed or strongly agreed that risk avoidance strategies are employed during planning process was, while 63.9% disagreed or strongly disagreed.

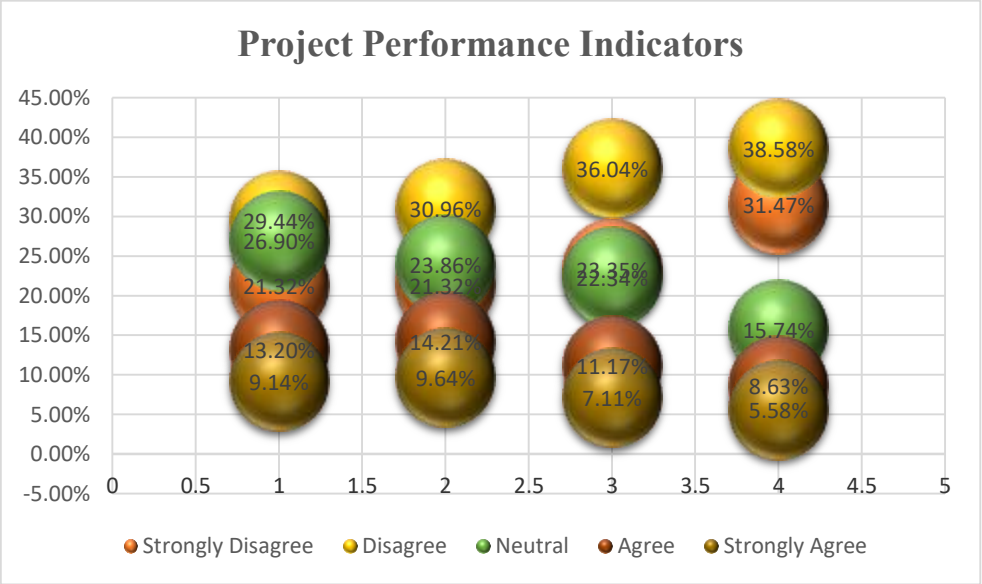

Figure 4. Project Performance Indicators
Source: Authors, Data obtained from Questionnaire, 2025

Similarly, 65.0% expressed doubts that risk transfer (through insurance or contracts) is employed, and 66.5% disagreed with the implementation of mitigation measures. Moreover, 74.6% disagreed with the statement that risks are monitored throughout the project lifecycle. These figures strongly support the claim by Zou et al. (2007) that lack of institutionalized risk transfer and monitoring system undermines infrastructure performance in developing settings. This aligns with Objective 2, which assessed the prioritization of risk practice across the lifecycle and was unsatisfactory.

As reflected in Figure 5, the findings on performance outcomes are predominantly negative with 50.8% of stakeholders reported that project scheduled timelines were not met, while 52.3% indicated budget overruns. Quality control also emerges weak, with 59.4% of respondents reporting completed projects failed to meet expectations of the stakeholders. On socioeconomic impact, 70.1% disagreed or strongly disagreed that there was a positive effect to the community, while 14.2% agreed. These findings support the (Chan & Chan, 2004) framework that links inadequate risk controls to failures across time, cost, quality, and satisfaction. This clearly meets the Objective 3: to assess the impact of risk management on the project outcomes, negative in the case of Lagos.

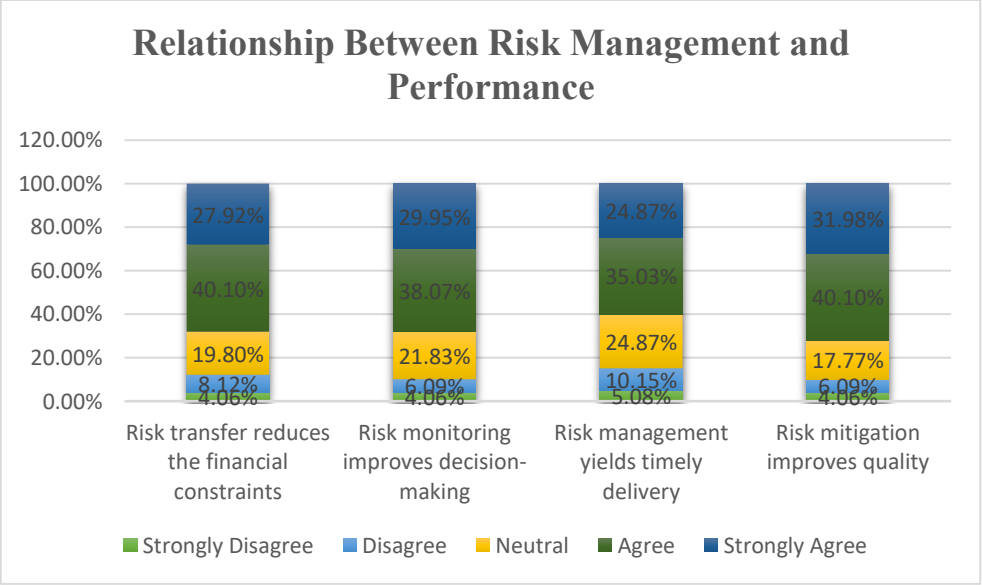

Figure 5. Relationship between Risk Management and Performance
Source: Authors, Data obtained from Questionnaire, 2025

Despite Implementation weaknesses, Figure 6 illustrates that there is a strong belief concerning the potential of risk strategies to enhance outcomes. 68.0% of respondents agreed (40.1%) or strongly agree (27.9%) that effective risk transfer reduces financial constraints, 77.6% asserted that active monitoring improves decision-making in execution, and 75.0% perceived a positive link between risk mitigation and project quality. These results indicate the gap between the conceptual support and practices, as described by Glette-Iversen, Flage, & Aven (2023). They support Objective 4 by demonstrating that stakeholders recognize the theoretical value of proactive risk management even if it's not operationalized.

2.3. Qualitative Data Collection

These public stakeholders include public officials at the Lagos State Ministry of Works and Infrastructure, project contractors and consultants, and residents with a total of twenty stakeholder units interviewed. The interviews were structured, allowing for participants to express their opinions on questions around project risk management, and institutional barriers and metrics for success.

2.4. Reliability and Validity

The internal consistency of all constructs was above the recommended threshold of 0.75 for Cronbach's Alpha when tested. Validity of the instrument was determined by two experts and experimental procedures. Given that the study employed triangulation between various data sources, the need for construct and content validity findings to be cross-checked was a major reason for using a mixed-method approach.

2.5. Ethical Considerations

The study submitted its ethical review to a board of experts by a recognized institutional review board. Through consent forms subjects were notified about project goals together with processes maintaining confidentiality and their right to stop their participation at any time. Throughout all stages of data gathering and the data reporting process the information remained anonymous.

Table 2. Demographics Summary of Respondents

Demographic Variable	Category	Frequency (n= 197)	Percentage %
Gender	Male	126	63.96
	Female	71	36.04
Age Group(years)	18-29	22	11.17
	30-39	69	35.96
	40-49	61	30.96
	50 and above	45	22.84
Educational Background	Secondary School	18	9.14
	Diploma/OND	29	14.72
	Bachelor's Degree	81	41.12
	Postgraduate Degree	69	35.03
Occupation	Government Official	51	25.89
	Contractors	44	22.34
	Regulatory Agency Staff	42	21.32
	Community Representative	60	30.46

Source: Authors, 2025

2.6 Results of Findings

This study utilized a total of 250 structured questionnaires which were circulated via email to government policymakers and implementers, transportation operators who construct and transport goods, regulatory agency personnel who monitor compliance, community representatives who are the end users, and local community leaders in road transportation infrastructural projects spread across Lagos Nigeria by focusing on four main participant categories. A total of 197 valid questionnaires were retrieved from the original distribution which enhances the reliability of the findings, with a response rate of 78.8%. The ideal stratified purposive sampling combined with rigorous follow up procedures, yielded a large enough sample to obtain diverse perspectives from across the entire body of stakeholders. The demographics of the participants revealed important information about the study shown. The data collected revealed that 63.96% of the sample population were male while 36.04% were female, in alignment with infrastructural gender ratios in Nigeria. The demographic information

indicated that majority of the sample population falls in the age group of 30-39 with 35.03%, followed by 40-49 years with 30.96%, below 29 years were 11.17% while 50 and above represents 22.84%. The respondents also had higher educational attainment where 41.12 had bachelor's degrees and 35.03 achieved postgraduate degrees but the highest-level education among 9.14% was secondary. Community representatives accounted for 30.46% of the study sample while governmental and regulatory agency officials at 25.89% and 21.32% while transportation operators represented 22.34%. The demographic distribution obtained indicates that the survey was adequately representative of the diverse pool of knowledgeable actors impacted by or interacting with infrastructure projects on the roads of Lagos. In combination, the advanced educational level and the wide age range of participants demonstrates the strength of insights, as they combine practical infrastructure experience with academic expertise.

Table 3. Predominant Risk Factor in Lagos Road Infrastructure Project

Risk Factor	High (%)	Average (%)	Low (%)	Total (%)
Financial Constraints	65.48	27.41	7.11	100.00
Poor Project Planning	58.37	30.96	10.67	100.00
Political Interference	62.44	29.44	8.12	100.00
Regulatory and approval delays	59.89	31.98	8.13	100.00
Land acquisition issues	56.85	34.01	9.14	100.0
Community opposition	50.25	36.04	13.71	100.00
Inconsistent Government policies	61.42	28.93	9.65	100.00
Corruption in procurement processes	66.50	25.89	7.61	100.00
Environment risk	49.24	35.03	15.73	100.0
Inflation and market volatility	63.45	30.46	6.09	100.0
Poor contractor performance	57.87	33.50	8.63	100.00
Labor and workforce challenge	52.79	37.56	9.65	100.00

Source: Authors, 2025

As shown in Table 7, the risk factors with the highest ratings were corruption in procurement (66.5%), financial constraints (65.5%), inflation and market volatility (63.5%), and political interference (62.4%). Poor project planning (58.4%) and poor contractor performance (57.9%) ranked lower but still notable. This risk profile Lagos' infrastructure challenges seem to be rooted more in systemic governance and economic instability rather than technical failures. The conclusion therefore aligns with findings of Omoregie and Radford (2006) and supports Objective 5, which aimed to identify Lagos-specific risk dynamics that hinder project delivery. Addressing these will necessitate reforms beyond engineering; encompassing legislative frameworks, institutional accountability, and financial resilience mechanisms.

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3. DISCUSSION

This study provides empirical evidence concerning the implementation of the risk management strategies within the Lagos roads infrastructure projects, highlighting critical gaps between theoretical practices and practical performance. The findings reveal a persistent reliance on reactive approaches, weak stakeholder engagement, and inadequate risk monitoring, which adversely affect projects delivery. These results mirror universal theoretical models but highlight the need for contextual in developing settings like Lagos.

In line with the risk management cycle discussed by Rejda and McNamara (2017), effective project delivery requires four practices, which are risk identification, evaluation, mitigation, and risk monitoring. Nonetheless, these findings indicate that over 59% respondents disagree that risks are systematically identified at the planning phase, and 76 respondents reported that there is absence of consistent monitoring. These data reflect that early-stage identification of the risk cycle is meant to guide downstream mitigation strategies. Rejda and McNamara opine that without this foundation, risk becomes unquantified, a pattern clearly shown in the current study. The connection between risk management and project performance was further supported by multidimensional performance framework proposed by Chan and Chan (2004) where success is defined as the combination of costs, time, quality assurance, and stakeholders' satisfaction. This framework was utilized to develop questionnaire items on project outcomes. Survey responses revealed that over 65% of stakeholders were not satisfied with budget adherence, time, and quality of the overall project. These weaknesses in performance support the theoretical expectations that inefficient risk management links with underperformance across all project's dimensions.

The issue of stakeholder exclusion had also emerged in the findings. Over 60 percent of the respondents reported that stakeholder agreements were rarely incorporated in risk planning. This is aligned with the proposed engagement model presented by Osei-Kyei and Chan (2015) which highlights that community participation reduces both social and political risk involved in the infrastructure development. These findings in Lagos reinforce the notion that when stakeholder engagement is weak or symbolic, it increases implementation difficulties, delays, and public dissatisfaction. Regarding risk transfer mechanisms, this study discovered limited use of insurance and the contractual provisions to assign responsibility, despite their international practice dominance, as noted by Zou et al. (2007). This gap reflects a deficiency between theoretical models, which assume formal institutional capabilities and legal enforcement, and informal system of fragmented governance in Lagos. Accordingly, the international models must be distorted and localized in the environment where regulatory compliance is weak, and contract implementation is inconsistent. Lastly, the perceived relationship between active risk monitoring and enhanced decision-making was strong, with over 70% of respondents acknowledged risk monitoring as an aid to timely interventions. Nonetheless, few projects demonstrated consistent monitoring practices. This misalignment highlights an important implementation gap. While the principles of risk management are well understood among practitioners, however, structural and institutional limitations prevent their translation into daily project practices.

Overall, these findings indicate that while theoretical models of risk management and performance assessment are conceptually applicable, their implementation in Lagos is hindered by politically interference, institutional fragmentation and the lack of technical capacities. Bridging this gap requires not only technical measures but systemic changes in stakeholder engagement, legal frameworks, and professional training.

3.1. Practical Risk Management Recommendations for Lagos Road Projects

This study recommends seven key actions to strengthen risk governance in the road infrastructure sector of Lagos.

- Establish a Project Risk Oversight Unit (PROU) within the Lagos State Ministry of Works to facilitate real-time monitoring of risk, enforcement of mitigation measures and quarterly reporting to the State Executive Council. This recommendation addresses failure of project teams to manage risks effectively throughout the project cycle.
- Introduce a Legislative Stakeholder Risk Engagement Framework (SREF) on all projects exceeding 1 billion naira. This recommendation will improve transparency and stakeholder inclusion.
- Facilitate early community consultation, visualize conflict risks, and formally incorporate stakeholder input. This is a suggestion dealing with the exclusion of stakeholders that is wide-spread leading to implementation delay.
- Collaborate with Lagos state infrastructure delivery academy, NSE and COREN to offer certification programs in practical risk management tools, including digital risk registers, contract-based risk allocation, building information modeling (BIM), etc. The research identifies capacity gaps that targeted trainings can address.
- Create a Risk-Indexed Infrastructure Financing Strategy by the Ministry of Finance, which links contingent finances with project vulnerability and risk performance indicators. This is valid considering that the effects of inflation and financial uncertainty are significant to the outcomes of infrastructures.
- Mandate the establishment of Environmental Risk Assessment teams within relevant sectors for large or ecologically sensitive project with flood and erosion risk assessments available during the design. This would enhance readiness towards environmental disturbances that are common in Lagos.
- To provide a post implementation system of risk audit, institutionalize a Post-Implementation Risk Audit System under an independent Infrastructure Risk Audit Board (IRAB) to assess completed projects, and measure risk mitigation results and provide annual reports to record improvements.

These seven measures form a comprehensive strategy to enhance infrastructure risk management in Lagos by addressing both institutional weaknesses and environmental realities.

3.2. Limitation of Study

The study acknowledges multiple constraints even though it has strong methodology while presenting easy-to-understand results. The project analysis relies significantly on participant self-report data which may contain measurement errors and potential bias in data about risk practices and project outcomes. As a result of using a cross-sectional research design, this study failed to gather time-based performance metrics and variations in risk elements. The research did not demonstrate how well its findings apply across Nigeria because the sample size was statistically adequate. The researchers encountered limitations during the data collection process because private sector exclusion due to access restrictions prevented them from receiving crucial insights into innovative risk management solutions.

CONCLUSIONS

According to reports of the current study, risk management in road infrastructure projects in Lagos is mainly responsive, informal, and under-institutionalized. The results indicate a lack of systematic risk identification, limited stakeholder engagement, and minimal monitoring throughout the project

lifecycle. The resulting effects in the project outcomes, i.e. costs management, timely completion, quality and satisfaction of project stakeholders, are easily identifiable. Over 70 percent of the practitioners reported an absence of structured risk identification processes, and nearly one-third of the completed projects were deemed functionally unsuccessful. These findings highlight the absence of enforceable, standardized risk governance as key factor contributing to the poor performance of infrastructure in Lagos. These findings are significant as they reflect the unique challenges in Lagos, including political instability, institutional fragmentation, environmental hazards, and unregulated urban sprawl. The study contributes to the current understanding of the topic due to holistic quantitative evidence of a local context of Lagos, as well as due to identifying the key implementation gaps and offering policy solutions based on the fiscal, legal, and urban specifications of Nigeria. Therefore, the study underscores the need to replace generic, externally designed models with localized and enforceable risk governance frameworks.

In the future, the following opportunities for change can be identified: institutionalization of monitoring project risks a specific oversight division, legalization of the procedures of stakeholder engagement, mainstreaming of environmental risks assessment, and performance-based funding techniques. An extension of the technical capacity, in terms of formal training and certification is also essential. All these recommendations offer a feasible blueprint to risk reengineering in Lagos road infrastructure industry. In case it is implemented, they may significantly enhance resilience, effectiveness, and public trust of the provision of the publicly built infrastructure in one of the most active and complicated urban spaces in Africa.

SUGGESTION FOR FUTURE RESEARCH

Analyzing completed projects constitutes the starting point for future research on risk management maturity as a key theme. Future research should explore the applicability of insights from road projects to other sectors such as, housing, water supply, and electricity infrastructure. Future investigations on project hazard detection and risk measurement need to include an analytic analysis of AI technology and digital tools application. A smart system technology introduced new methods to handle risks throughout all components of the infrastructure system. For example, Zhu et al. (2018) presented a study of self-operating remote-controlled smart irrigation sprinklers in agricultural engineering. The irrigation system operates with wireless sensor networks accompanied by automated control systems and soil moisture sensors for delivering highly efficient water use technology which reduces safety risks related to water constraints as well as climate change effects. A potential solution for road transportation infrastructure development relies on this particular operational technique that replaces human control with real-time guided autonomous systems to minimize risks. The road development project in Lagos must integrate modern technology platforms which will minimize environmental damage alongside construction failures while managing high traffic density. Analyzing intelligent system applications in other sectors enables discovery of innovative methods for managing infrastructure risk. A study of rural projects across states needs to establish environmental conditions, where identified risks hold either positive or negative values

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