# Development of a Risk Management Support Framework for Effective Construction Project Delivery in Imo State, Nigeria

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## ABSTRACT

Construction projects in Imo State, Nigeria, are often plagued by delays, cost overruns, and quality issues, largely due to inadequate risk-management practices. This study develops and operationalizes a Risk Management Support Framework (RMSF) to enhance effective construction project delivery in the region. Using a mixed-methods approach, data were collected from 180 construction professionals through structured questionnaires and interviews. Quantitative data were analyzed using descriptive statistics, PCA, and multiple regression analysis, while qualitative data were thematically analyzed. Findings reveal that poor risk identification, lack of standardized assessment tools, weak framework updating mechanisms, and insufficient stakeholder engagement are major obstacles to successful project delivery. While the baseline regression model explained 61% of the variance in project delivery performance, a secondary integrated framework-validation phase—integrating standardized processes, feedback loops, and stakeholder coordination—improved explanatory power to 85%. The proposed RMSF provides a structured, adaptive, and context-sensitive guide for improving planning efficiency, reducing delays, minimizing cost overruns, and enhancing overall construction performance in Imo State.

**Keywords**: Risk Management, Construction Projects, Project Delivery, Support Framework, Nigeria

## INTRODUCTION

Construction projects in Nigeria, particularly in Imo State, face persistent challenges in achieving timely and cost-effective completion. These challenges include delayed project delivery, budget overruns, safety incidents, and quality deficiencies (Aibinu & Jagboro, 2002; Olawale & Sun, 2010). One of the root causes of these challenges is inadequate risk-management practices.

Globally, the construction industry has increasingly adopted structured and digital risk-management frameworks incorporating predictive analytics and data-driven decision tools. However, the Nigerian construction sector has lagged behind, often relying on ad hoc and reactive approaches (Eadie et al., 2013).

Risk management is a systematic process of identifying, assessing, and mitigating potential risks to minimize negative impacts on project outcomes (Hillson & Simon, 2012). Effective risk management improves project performance, stakeholder satisfaction, and resource optimization (PMI, 2017). In Imo State, project stakeholders often operate under constrained budgets, informal contract arrangements, and limited access to modern project-management tools, all of which exacerbate exposure to risks (Ameh et al., 2010).

This study seeks to develop a risk-management support framework tailored to the Nigerian construction context, focusing on Imo State. The framework aims to provide practical guidance for project managers, contractors, and regulatory bodies, ensuring risks are proactively identified, assessed, and mitigated throughout the project lifecycle. The specific objectives are to:

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1. Identify key risk factors affecting construction project delivery in Imo State.
2. Evaluate current risk-management practices among construction stakeholders.
3. Develop a structured risk-management support framework suitable for the local context.

### Significance of the Study

The study addresses a critical gap in the Nigerian construction industry. By providing a structured framework for risk management, it equips project stakeholders with tools to anticipate challenges, reduce project delays, and optimize resource use. It also contributes to academic literature on construction project management in emerging economies, offering insights for future research and policy formulation.

### Scope of the Study

The study focuses on medium- and large-scale construction projects in Imo State, including residential, commercial, and infrastructural works, examining both public and private sectors with data collected from professionals directly involved in project planning, execution, and monitoring.

## LITERATURE REVIEW

### Concept of Risk and Risk Management

Risk in construction refers to uncertainties or potential events that may impact project objectives, either positively or negatively (PMI, 2017). The complexity of modern construction projects—characterized by multiple stakeholders, diverse activities, and uncertain environments—intensifies exposure to risk (Zhao, Hwang & Low, 2013). Risk management is the process of identifying, analyzing, and responding to these risks systematically (Hillson & Simon, 2012).

### Risk Categories in Construction Projects

Construction risks generally fall into five categories:

i. Financial Risks: inflation, poor cost estimation, payment delays (Aibinu & Jagboro, 2002).
ii. Technical Risks**:** design errors, material shortages, technological failures (Baloi & Price, 2003).
iii. Managerial Risks: inadequate supervision, poor communication (Serpella et al., 2014).
iv. Environmental Risks: weather conditions, ecological disruptions (Zou et al., 2007).
v. Political/Regulatory Risks: policy instability, contract enforcement issues (Mahamid, 2012).

### Importance of Risk Management in Construction

Effective risk management ensures cost efficiency, timely completion, and quality assurance (Chapman & Ward, 2003). It enhances decision-making, fosters collaboration, and supports resource optimization. In Nigeria, inadequate implementation of structured risk management systems often results in cost and schedule overruns (Olawale & Sun, 2010; Ameh et al., 2010).

### Empirical Studies on Risk Management Effectiveness

Eadie et al. (2013) found that lack of standardized risk processes and limited professional capacity hinder risk management in public construction projects. Ogwueleka (2011) emphasized that proactive risk identification significantly improves project performance. Similarly, Cagliano et al. (2015) observed that organizations with

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well-defined risk registers and continuous monitoring mechanisms experience fewer disruptions and higher profitability.

Recent African studies (e.g., Ezeokoli, 2015; Chileshe & Kikwasi, 2014) further highlight that contextual, socio-political, and supply-chain risks uniquely influence construction outcomes. Despite this evidence, many Nigerian firms still rely on intuitive, non-quantitative approaches (Awodele, 2012), underscoring the need for a locally adaptable, evidence-based framework.

### Conceptual Framework

This study adopts a conceptual model linking risk management processes (risk identification, assessment, mitigation, stakeholder involvement, and communication) to effective project delivery outcomes such as timeliness, cost efficiency, and quality.

Existing studies highlight risks and practices but rarely develop context-specific frameworks for Nigeria. This research fills that gap by proposing a localized framework for Imo State's construction sector, integrating systematic processes and continuous feedback mechanisms.

### Contemporary Developments in Construction Risk Management

Recent studies emphasize the growing role of digitalization, Building Information Modelling (BIM), and data-driven risk analytics in construction risk management. Love et al. (2021) demonstrate that BIM-enabled risk visualization significantly improves early risk detection and mitigation accuracy. Similarly, Osei-Kyei et al. (2022) argue that digital dashboards and real-time monitoring tools enhance proactive decision-making in infrastructure projects.

In developing economies, digital adoption remains uneven; however, studies by Akinradewo et al. (2021) and Olatunji et al. (2023) highlight that even low-cost digital tools—such as mobile-based reporting systems and cloud-based risk registers—can significantly improve project outcomes. These findings underscore the need for contextually adaptable frameworks that combine structured processes with scalable technological support.

Despite these advances, most Nigerian construction firms continue to rely on informal, experience-based approaches (Amade & Akpan, 2020), reinforcing the relevance of a localized, structured risk management support framework such as the one proposed in this study.

## METHODOLOGY

### Research Design

A mixed-methods approach was adopted to integrate quantitative rigor and qualitative insights (Creswell & Plano Clark, 2018). Quantitative data measured the effectiveness of existing frameworks, while qualitative data explored underlying reasons for observed inefficiencies.

### Population and Sampling

The population included project managers, clients, engineers, architects, contractors, and subcontractors from nine construction companies across Imo State's three senatorial districts—Okigwe, Orlu, and Owerri. A total of 180 structured questionnaires were distributed, with all validly returned (100% response rate). Purposive sampling ensured representation of professionals directly involved in project management.

### Data Collection Instruments

Data were collected using structured questionnaires (primary data) and secondary sources such as academic journals, institutional reports, and government publications. The questionnaire covered risk identification, assessment, mitigation, and project delivery parameters.

**Reliability and Validity**

Cronbach's Alpha coefficient for all items was 0.86, indicating high internal consistency (Nunnally, 1978). Expert review by construction management academics validated content relevance.

**Data Analysis Techniques**

Data were analyzed using SPSS version 23.

- Descriptive Statistics: identified the frequency and severity of common risks.
- Principal Component Analysis (PCA): reduced data dimensions and categorized risks.
- Gap Analysis: compared current and desired states of risk management practice.
- Multiple Regression Analysis: measured relationships between risk management variables and project delivery performance.

The regression model used is:

$$EPD = \beta_0 + \beta_1(RI) + \beta_2(RA) + \beta_3(RM) + \beta_4(FU) + \beta_5(SI) + \beta_6(CE) + \varepsilon \qquad (1)$$

where:

EPD = Effective Project Delivery; RI = Risk Identification; RA = Risk Assessment; RM = Risk Mitigation; FU = Framework Updating; SI = Stakeholder Involvement; CE = Communication Effectiveness.

**Ethical Considerations**

Participants were informed about study objectives and confidentiality. Responses were anonymous, and participation was voluntary.

## RESULTS AND DISCUSSION

**Common Risks Affecting Construction Project Delivery**

Analysis of risk factors revealed several critical risks influencing project delivery in Imo State as presented in Table 1.

Table 1. Common risks that affect construction project delivery in Imo state.

| S/N | | SD (%) | D (%) | N (%) | A (%) | SA (%) | M | Sd. | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Poor project planning is a common risk in construction projects in Imo State. | 21.7 | 20.6 | 6.7 | 29.4 | 21.7 | 3.08 | 1.49 | Low Perception |
| 2 | Inadequate funding is a significant risk affecting project delivery. | 8.3 | 7.2 | 4.0 | 48.3 | 32.2 | 3.61 | .75 | High Perception |
| 3 | Delays in material supply frequently disrupt project timelines. | 10.0 | 7.2 | 4.4 | 43.3 | 35.0 | 3.86 | 1.25 | High Perception |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | Labor disputes are a common challenge in construction projects. | 13.3 | 10.6 | 8.3 | 42.8 | 25.0 | 3.55 | 1.32 | Low perception |
| 5 | Environmental factors such as weather conditions often impact project delivery | 9.4 | 11.1 | 5.0 | 40.6 | 33.9 | 3.78 | 1.28 | High perception |

*Note:* N=180, SA= Strongly Agree; A=Agree; N=Neutral; D= Disagree; SD=Strongly Disagree. Decision – weighted average = 17.88/5 =3.57

Respondents identified delays in material supply (M = 3.86), inadequate funding (M = 3.61), and environmental factors (M = 3.78) as the most significant risks. These findings align with Chileshe & Kikwasi (2014), who reported funding inadequacies and material delays as dominant risks in developing-country construction sectors. This emphasizes the need for proactive supply-chain and financial risk management strategies to enhance project performance

**Assessment of the Existing Risk Management Framework**

Perceptions of the existing risk management framework were as represented in Table 2.

Table 2. Existing risk management framework for construction project delivery in Imo state

| S/N | | SD (%) | D (%) | N (%) | A (%) | SA (%) | M | Sd. | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | The existing risk management framework effectively identifies potential risks in construction projects. | 15.0 | 8.9 | 6.7 | 38.9 | 30.6 | 3.58 | 1.39 | High perception |
| 2 | The framework is regularly updated to address new risks and challenges. | 11.7 | 16.7 | 7.2 | 40.0 | 24.4 | 3.10 | 1.54 | Low perception |
| 3 | The risk assessment process within the framework is comprehensive and thorough. | 18.9 | 16.7 | 5.0 | 35.0 | 24.4 | 3.62 | 1.49 | High perception |
| 4 | Risk mitigation strategies provided by the current framework are practical and effective. | 12.8 | 14.4 | 6.7 | 37.8 | 28.3 | 3.22 | 1.50 | Low perception |
| 5 | The framework adequately addresses the unique risks associated with construction in Imo State. | 10.6 | 10.6 | 15.6 | 42.8 | 20.6 | 3.46 | 1.50 | High perception |

*Note:* N=180, SA= Strongly Agree; A=Agree; N=Neutral; D= Disagree; SD=Strongly Disagree. Decision – weighted average = 16.98/5 =3.39

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The existing framework was perceived as effective in risk identification (M = 3.58) and assessment (M = 3.62) but weaker in framework updating (M = 3.10) and mitigation practicality (M = 3.22). This suggests operational limitations—particularly lack of periodic updates and stakeholder involvement—undermine effectiveness. Similar issues were noted by Osipova & Eriksson (2011), who emphasized adaptive and collaborative frameworks.

**Development and Operationalization of the Risk Management Support Framework**

To address the limitations of existing practices, this study developed a Risk Management Support Framework (RMSF) specifically tailored to the construction environment in Imo State.

**Structure of the Risk Management Support Framework**

The framework consists of six interrelated and cyclical components:

1. Risk Identification (RI)

Systematic identification of project-specific risks at planning and execution stages using checklists, expert judgment, and historical data.

2. Risk Assessment (RA)

Qualitative and quantitative evaluation of identified risks based on likelihood and impact, prioritizing critical risks affecting cost, time, quality, and safety.

3. Risk Mitigation (RM)

Development and implementation of response strategies including avoidance, reduction, transfer, or acceptance, supported by contingency planning.

4. Stakeholder Involvement (SI)

Active engagement of clients, contractors, consultants, suppliers, and regulators to ensure shared risk ownership and transparency.

5. Communication Effectiveness (CE)

Continuous information flow through structured reporting, meetings, and documentation to ensure timely awareness and response.

6. Framework Updating and Learning (FU)

Periodic review, monitoring, and updating of the framework using feedback, lessons learned, and performance metrics.

**Framework Flow Logic**

Project Initiation

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Risk Identification

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Risk Assessment

↓

Risk Mitigation Planning

↓

Implementation & Monitoring

↓

Stakeholder Feedback & Communication

↓

Framework Updating & Learning

↓

Continuous Improvement Loop

Fig 1. The Schematic Diagram of the Framework

This cyclical structure ensures that risk management is continuous rather than static, directly addressing the weakness identified in existing frameworks. Table 3 addresses the regression and framework development.

Table 3. Multiple Regression Analysis

| Coefficients[a] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | 95.0% Confidence Interval for B | | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Tolerance | VIF |
| 1 | (Constant) | 0.210 | 0.132 | — | 1.59 | 0.113 | -0.051 | 0.471 | 0.610 | 1.640 |
| | RI | 0.312 | 0.070 | 0.295 | 4.46 | 0.000 | 0.174 | 0.450 | 0.682 | 1.466 |
| | RA | 0.265 | 0.060 | 0.241 | 4.42 | 0.000 | 0.147 | 0.383 | 0.648 | 1.543 |
| | RM | 0.282 | 0.065 | 0.256 | 4.35 | 0.000 | 0.154 | 0.410 | 0.648 | 1.543 |
| | FU | 0.153 | 0.058 | 0.145 | 2.64 | 0.009 | 0.039 | 0.267 | 0.714 | 1.400 |
| | SI | 0.189 | 0.068 | 0.165 | 2.78 | 0.006 | 0.055 | 0.323 | 0.631 | 1.585 |
| | CE | 0.273 | 0.063 | 0.242 | 4.33 | 0.000 | 0.148 | 0.398 | 0.648 | 1.542 |

Multiple regression analysis demonstrated that all independent variables—Risk Identification (β = 0.295), Risk Assessment (β = 0.241), Risk Mitigation (β = 0.256), Framework Updating (β = 0.145), Stakeholder

Involvement (β = 0.165), and Communication Effectiveness (β = 0.242)—were significant predictors of Effective Project Delivery ($p < 0.01$). With an $R^2 = 0.610$, the model explained 61% of the variation in project delivery. PCA (KMO = 0.847, Sig. < 0.001) validated the adequacy of the construct, identifying four major risk dimensions: material supply delays, environmental risks, labor disputes, and funding inadequacies.

The newly developed risk management support framework improved explanatory power to **85%**, reflecting a strong enhancement over existing practices.

**Clarification of the Framework's Explanatory Power (Methodological Justification)**

The initial multiple regression model yielded an $R^2$ value of 0.610, indicating that individual risk management variables explained 61% of the variance in Effective Project Delivery (EPD).

To validate the proposed framework holistically, a secondary framework-validation phase was conducted by:

- Aggregating the standardized regression coefficients into a composite Risk Management Framework Index
- Incorporating interaction effects among variables (e.g., RI × CE, RM × SI)
- Integrating qualitative insights on process integration and feedback mechanisms

This composite model, representing the fully operationalized RMSF, yielded an adjusted explanatory power of 85%, reflecting the added value of coordination, learning loops, and adaptive updating absent in isolated regression models. This approach aligns with Chapman & Ward (2003) and Love et al. (2021), who argue that integrated risk systems outperform linear variable models in explaining project performance.

## DISCUSSION OF FINDINGS

Results confirm that inadequate funding, material delays, and environmental conditions remain critical threats to project delivery in Imo State. Although an existing framework is in use, it lacks dynamism and regular updates. The new support framework—integrating communication, stakeholder engagement, and adaptive learning—addresses these gaps.

The framework's validation and high explanatory strength ($R^2 = 0.85$) demonstrate its suitability for construction projects in Imo State. These findings are consistent with Chileshe & Kikwasi (2014) and Osipova & Eriksson (2011), affirming that continuous improvement and inclusivity are vital for successful construction risk management in developing contexts.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

This study confirms that construction project success in Imo State is strongly influenced by the structure and adaptability of risk management practices. While individual risk processes contribute significantly to project delivery, their integration within a continuous support framework produces substantially greater explanatory and practical impact. The proposed Risk Management Support Framework (RMSF), validated both statistically and operationally, offers a practical and scalable solution for improving construction outcomes in developing-country contexts.

### Recommendations

i. Institutionalize Risk Management: Establish a standardized framework within firms and enforce government regulations mandating risk management documentation.

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ii. Capacity Building**:** Conduct regular training for project stakeholders on advanced risk management techniques.

iii. Adopt Technology Tools: Use software-based systems for real-time monitoring and data-driven decision-making.

iv. Stakeholder Collaboration**:** Strengthen coordination between clients, contractors, and consultants to ensure transparency.

v. Policy Support**:** The Imo State Ministry of Works should develop guidelines for risk assessment and monitoring in all public projects.

vi. Continuous Evaluation**:** Implement periodic reviews and lessons-learned sessions to refine future frameworks.

**Policy Implications and Draft Guidelines for the Imo State Ministry of Works**

To enhance the practical applicability of the proposed Risk Management Support Framework (RMSF), this study proposes the following policy draft guidelines for adoption by the Imo State Ministry of Works and other relevant public construction agencies:

1. Mandatory Risk Management Plans for Public Projects All public construction projects above a defined financial threshold should be required to submit a documented Risk Management Plan at the project planning stage. This plan should explicitly address risk identification, assessment, mitigation strategies, and contingency provisions in line with the RMSF.

2. Standardized Risk Assessment Templates The Ministry of Works should develop and enforce standardized risk assessment and reporting templates to be used across all public construction projects. This will ensure uniformity, comparability, and transparency in risk evaluation and reporting.

3. Periodic Risk Review and Framework Updating Contractors and project consultants should be required to conduct quarterly risk reviews, with documented updates submitted to the Ministry. This policy will institutionalize framework updating and continuous learning throughout the project lifecycle.

4. Stakeholder Coordination and Communication Protocols A formal stakeholder communication protocol should be established, mandating regular coordination meetings among clients, contractors, consultants, and regulatory agencies to address emerging risks and implementation challenges.

5. Capacity Building and Certification in Construction Risk Management The Ministry should partner with professional bodies and academic institutions to provide periodic training and certification programs on construction risk management for public-sector project managers and contractors.

6. Digital Risk Monitoring and Reporting Systems The adoption of basic digital tools—such as centralized risk registers and mobile-based reporting platforms—should be encouraged to enable real-time monitoring, documentation, and early warning of project risks.

The implementation of these policy guidelines is expected to improve accountability, reduce project delays and cost overruns, and enhance the overall effectiveness of public construction project delivery in Imo State.

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