Project Risk Management: Exploring Best Practices and Performance of Selected Construction Companies in Nigeria

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Abstract

Construction performance and risk management have been widely discussed in literature from various perspectives. The main objective of performing risk management in the construction industry is to ensure timely delivery of good construction within a specific budget. However, evidence from literature suggests that the construction industry still records poor project performance, which is a result of construction cost overruns, time overruns, poor project definition, changes in project scope, and poor-quality construction, all of which have significant negative outcomes on project performance and are suggestive of insufficient project risk management practices. In spite of various studies on project risk management practices and firm performance, not much attention has been given to testing the effect of project risk management practices on performance in the construction industry. Hence, this study investigated the best practices and performance of selected construction companies in Nigeria regarding project risk management. Survey research design was adopted. The population was 202 top management and mechanical department staff of three selected construction companies in Lagos State, Rivers State, and the Federal Capital Territory of Abuja, Nigeria. A sample size of 176 was found to be usable. A validated questionnaire was adopted for data collection. Cronbach's alpha reliability coefficients for the constructs ranged from 0.74 to 0.98. The response rate was 87.1%. Data were analyzed using the Smart partial least squares structural equation modeling (PLS-SEM) software, which allowed for the testing of path analysis and hypotheses. A confirmatory factor analysis (CFA) was employed to assess the factor loading of the variables. The results showed that project risk management practices had significant effect on performance of selected construction companies in Nigeria ($Adj\ R^2 = 0.810$, $F^2 = 0.058$, $Q^2 = 0.790$, $p < 0.05$). The study concluded that project risk management practices improved the performance of the selected construction companies in Nigeria. The study recommended that prior to project initiation, project managers should conduct thorough risk identification, risk assessment, risk monitoring, and risk mitigation to analyze potential risks to project performance and consider both internal and external factors that may influence project performance.

Keywords: *Project performance, Project quality, Project risk management practices, Risk assessment, Risk mitigation*

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Background to the Study

The construction industry is one of the economic cornerstones of success for modern countries as a result of rapid economic development, which has increased demand for the construction of infrastructure and facilities around the globe (Fakhratov et al., 2020). The nature, incident, and impact of risk in road construction projects have become topics of interest because of their effects on quality, time, and cost. Construction projects often face a lot of uncertainties, which places the performance of road construction projects at risk of cost and time overruns as well as poor quality delivery and scope reduction. Risk is important to contractors as well as clients and consultants within road construction projects; however, the problems of risk management are complex and poorly understood in practice (Gransberg & Maraqa, 2022). Projects with weak risk management practices lose time, experience cost overruns, get low profit margins, and are not cost-effective, which results in the increased importance of risk management as a critical issue for project performance (Jeon et al., 2022).

Globally, road construction projects are faced with challenges of risk management (Kelly & Ilozor, 2022). In the United States of America (USA), over 900 people die every year in automobile crashes in highway work zones. In addition, 40,000 motorists involved in highway work zone crashes suffer injuries, and 52,000 are involved in property damage (Kelly & Ilozor, 2022). The construction industry is complex and associated with uncertainties such as regulatory risk, changing technology, changes in the project environment, market conditions, scheduling errors and contractor delays, and risk of failure to comply with contractual quality requirements (Lotfi et al., 2022; Shi et al., 2022). Abal-Seqan et al. (2023) and Ojiako et al. (2023) found that a significant majority (98%) of large construction projects in the United States face cost overruns exceeding 30%. These overruns are attributed to several factors, including time delays, inadequate scope definition, and quality standardization issues, poor cost estimates during planning, design changes, and payment delays. As a result, construction firms experience reduced profit margins, material shortages due to budget limitations, damage to their reputation, and further delays, which are already prevalent in the industry. Ingle and Mahesh (2022) further reveal that a considerable portion (77%) of construction projects in the US suffer from delays of at least 40%. Some uncontrollable factors, such as adverse weather conditions, labor shortages, and equipment failures, contribute to these delays and negatively impact overall project performance.

In the United Kingdom (UK), despite the global increase in the development of different projects in the construction industry, it is still behind other industries due to several challenges, including cost overruns, time delays, inadequate scope definition, and poor-quality construction (Njang'iru et al., 2020). The size of the global construction market exceeds £8 trillion, with the UK's construction sector valued at £164 billion (Alkilani & Loosemore, 2022). In the first four months of 2022, the value of construction output in Great Britain increased by a total of 6.5% year over year (YoY), driven by increases in both new and repair and maintenance work with 6.7% and 6.3%, respectively (Abal-Seqan et al., 2023). Also, construction material prices were on the rise in the UK significantly over the past two quarters in 2022, with rising inflation and the Russia-Ukraine crisis added further pressure in 2022 (Unegbu et al., 2022). The construction industry in Asia faces significant problems that

hinder its performance and success (Deiva & Kalpana, 2022). In Singapore, despite a modest increase in the construction industry, there is a persistent labor shortage that negatively impacts project execution. Furthermore, Singapore experiences cost overruns, scheduling delays, inadequate scope definition, and poor-quality construction, leading to a deterioration in project performance over time (Alfreahat & Sebestyen, 2022). In Malaysia, the construction industry is plagued by poor performance in terms of time and cost management. Many projects suffer from substantial time and cost overruns, indicating a failure to achieve effective project performance. This undermines the overall success and delivery of construction projects in the country (Kong et al., 2021).

Similarly, in the United Arab Emirates (UAE), the construction industry faces significant challenges. Many ongoing construction projects in the UAE experience prolonged durations due to cost overruns, project time delays, issues with project scope, and poor project quality. Construction firms in the UAE also lack reliable methodologies to assess and evaluate risks adequately, hindering their ability to eliminate, reduce, or mitigate potential risks (Liu et al., 2023). These problems across Asia's construction industry, including labor shortages, cost overruns, scheduling delays, inadequate scope definition, poor-quality construction, and inadequate risk management approaches, pose significant obstacles to achieving efficient and successful construction project outcomes (Esa et al., 2020). Addressing these issues requires comprehensive strategies and interventions to enhance labor management, project planning, cost control, scope definition, quality assurance, and risk management practices (Zhu et al., 2020). The construction industry in Africa is a key contributor to the region's economy, accounting for approximately 6% of GDP (Abdilahi et al., 2020; Lapidus et al., 2022). However, it faces significant challenges that make it highly risky (Mwanza et al., 2020). These challenges encompass construction risks related to site conditions, labor efficiency, and physical risks, as well as technical, financial, organizational, environmental, and socio-political risks (Renault et al., 2020). These factors contribute to issues such as cost overruns, time delays, inadequate scope definition, and poor-quality construction in Africa's construction industry (Durdyev, 2021; Ellis et al., 2021). Construction projects in Nigeria face complexities and uncertainties, often resulting in difficulties meeting project deadlines (Akinradewo et al., 2020; Mohammed & Adindu, 2021). The industry has experienced a decline in project standards, characterized by poor conception, planning, and unprofessional execution. This is attributed to inadequate risk identification, assessment, monitoring, control, and mitigation (Bukar & Ibrahim, 2021).

The unpredictable lifespan of many construction projects in Nigeria is marked by abandoned projects due to inadequate project scope planning, time delays, and reduced quality. Failed and abandoned road projects pose ongoing challenges and concerns within the construction industry (Fashina et al., 2020). The primary goal of risk management in the construction business is to assure timely delivery of construction projects within a defined budget, scope, time and quality (Rtayli & Enneya, 2020; Sadeghi et al., 2022). One of the biggest challenges in construction project risk management is undefined goals (Gobov & Huchenko, 2021). However, the failure of many construction projects to fulfil time schedules, cost, scope and quality standards is on the increase and shows no indications of abating year after year,

resulting in enormous financial losses of road works (Akande et al., 2018; Tazikova et al., 2023; Wang et al., 2023). The absence of project risk management practices and processes in the Nigerian construction industry has led to many project failures, collapses and abandonment thereby causing the under development of the industry over the years (Butt et al., 2021).

Existing studies (Abal-Seqan et al., 2023; Hassan & Asghar, 2021; Ingle & Mahesh, 2022; Unegbu et al., 2022; Zhou et al., 2020) have examined the impact of project risk management practices on project performance, but a research gap exists in terms of geographical focus. Most studies (Althiyabi & Qureshi, 2021; Renault et al., 2020; Uwanyirigira & Rusibana, 2020) have primarily concentrated on project risk management and success in developed countries, neglecting the relationship between project risk management and performance in emerging and developing countries (Ajmal et al., 2020; Zhao et al., 2019). This gap highlights the need for further investigation into the impact of project risk management on project performance within the specific context of developing countries, as emphasized by researchers Carvalho and Rabechini (2015) and Mwanza et al. (2020). In response to this gap, the present study examined the influence of project risk management practices on project performance, specifically within the context of developing nations such as Nigeria. Hence, this study filled this knowledge gap on project risk management practices and performance of construction companies in Nigeria.

Literature Review

This section focused on concepts of project risk management practice, risk identification, risk assessment, risk monitoring and control, risk mitigation, project performance, project scope, project cost, project time, and project quality.

Project Performance

Project performance refer to the accomplishment of a given construction project against the contractual cost, scope, time and quality standards (Omajuwa & Iheama, 2022). Project performance is the actual realization of project goals and objectives. It involves implementing a project according to plan, time schedule, budget and scope (Unegbu et al., 2022). Project performance is the totality of time, cost and quality performance of a given project (Ingle & Mahesh, 2022). Klaus-Rosińska and Iwko (2021) furthermore, opined that project performance is the success of construction project using key performance indicators such as; cost, time, quality, health and safety, client satisfaction, productivity and, environmental impacts in achieving project goals. In view of the various definition in literature, the researcher defines project performance as the overall measurement if a project has met its objectives and requirements of scope, cost, time, quality and schedule. For the purpose of this study, project performance is measured by project scope, project cost, project time, and project quality. These variables are explained and discussed.

Project scope is a part of the project planning process that documents specific goals, deliverables, features, and budgets (Abdilahi et al., 2020). Project scope describes the boundaries of the project in terms of what it will or will not deliver (Gobov & Huchenko,

2021). Project scope is the total work to be executed on the project to generate expected deliverables (Ajmal et al., 2022). Muneer et al (2022) defined project scope as that specific work required to create project deliverables. Project cost is the total funds available for the execution of the project and it includes direct and indirect costs (Kusonkhum et al., 2022). Lapidus, et al (2022) defined project cost as the summation of material and labour costs, plant and equipment costs, head office running costs, risk contingency costs, site overheads and profit. According to Abdel-Hamid and Abdelhaleem (2021) project cost refers to the entire sum of money required to finish the project's work.

Construction project time refers to the duration for completing a construction project (Kikwasi & Sospeter, 2022). Project time is a specified period during which a process or action, process exists or happens (Liang & Liu, 2022). According to PMBOK (2022) project time refer to the processes required to accomplish timely completion of the project, which includes in processes such as activity definition, activity sequencing, activity resource estimating, activity duration estimating, schedule development, and schedule control. Project time is the duration spent on the advancement of project tasks and project activities (Amoh & Acheampong, 2021). According to Alonso-Conde and Rojo-Suarez (2020) project quality is defined as conforming to a project's statutory, aesthetic, and functional standards. According to Mohamed (2019) project quality also refers to how closely the final result matches the expectations of the client. Amoah and Sibelekwana (2023) define project quality as the execution of construction projects in accordance with the planned quality criteria. Hoque et al. (2021) define project quality as the attainment of acceptable levels of performance from construction activities.

Project Risk Management Practices
Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one of the project goals, such as time, cost, scope, or quality (Testorelli & Verbano, 2022), while project risk management practices involve the process of identifying, analyzing, and responding to any risk that arises over the life cycle of a project to help the project remain on track and meet its goal (Cantillo & Van Caillie, 2023). PMBOK (2022) defines project risk management practices as the identification, assessment, and prioritization of risks, followed by the coordinated and economical application of resources to reduce, monitor, and control the possibility and/or impact of unfortunate events. In view of the various definition in literature, the researcher defines project risk management practices as the process of identifying, analyzing, and responding to any risk that arises over the life cycle of a project to help the project remain on track and meet its goal. For the purpose of this study, project risk management practices are measured by risk identification, risk assessment, risk monitoring and control, and risk mitigation. These variables are explained and discussed.

Project risk identification is the process of determining which risks may affect the project and documenting their characteristics (Kalpana, 2023). The key benefit of this process is documentation of existing risks and the knowledge and skills offered by the project team anticipate risk events (Tazikova et al., 2023). Project risk identification is the process of identifying individual project risks and opportunities in a manner which makes analysis

possible (Deiva & Kalpana, 2022). A project risk assessment is a process that aims to gain a deeper understanding of which project tasks, deliverables, or events could influence its success (Koelmans et al., 2022). Project risk assessment is a process of identification, classification, and quantitative and qualitative analysis of risks affecting projects (Shahed et al., 2021).

Project risk assessment is the overall process of risk identification, risk analysis and risk evaluation (Can Saglam et al., 2021). According to PMBOK (2022) project risk assessment consists of risk identification (the process of finding, recognising and describing risks), risk analysis (the process to comprehend the nature of risk and to determine the level of risk, and risk evaluation (the process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable and tolerable). Project risk assessment is an integral part of risk management. In any risk assessment it must be understood what questions the risk assessment is trying to answer. Ultimately, this is driven by the stakeholders needs (Zhang et al., 2022). Project risk monitoring and control is the systematic collection and analysis of information at regular intervals on a current project so as to relate the actual impacts of the project against the objectives set for facilitating making decisions (Tariq, 2023). Project risk monitoring and control means actively reviewing the status of your project as it proceeds, evaluating potential obstacles, and implementing necessary changes (Obondi, 2022).

Project risk mitigation on the other hand refers to practices to minimize risks (Lapidus et al., 2022). Project risk mitigation to the different methods of dealing with threats to a project (Ibrahim & Elshwadfy, 2021). Risk Mitigation involves the development of plans to manage, prevent or reduce potential risk to an acceptable level (Sharma et al., 2021). Project risk mitigation is a strategy to prepare for and lessen the effects of threats faced by a business (Akinradewo & Aigbavboa, 2019). Comparable to risk reduction, risk mitigation takes steps to reduce the negative effects of threats and disasters on business continuity (Ajmal et al., 2020). Project risk mitigation refers to the process of planning and developing methods and options to reduce threats or risks to project objectives (Durdyev, 2021). A project team might implement risk mitigation strategies to identify, monitor and evaluate risks and consequences inherent to completing a specific project, such as new product creation (Can Saglam et al., 2021).

Empirical Review
Khahro et al. (2023) affirmed that project risk management had significant effect on construction project performance. Ojiako et al. (2023) indicated project portfolio management practices had significant relationship between organizational ambidexterity and project performance success. Abal-Seqan et al. (2023) revealed that project success factors had significant impact on the performance of construction projects. Unegbu et al. (2022) showed a significant relationship between project performance measures and project management practices of construction projects for the construction industry in Nigeria. Sami et al. (2022) indicated that project risk management had significant influence on project performance. Ingle and Mahesh (2022) found out that project risk management had significant impact on construction project performance.

The study of Alkilani and Loosemore (2022) further discovered that project performance measurement had a significant effect on the performance small-and-medium sized construction contractors. Klaus-Rosińska and Iwko (2021) revealed that stakeholder management had a positive influence on one of the clues of sustainable project management as an underestimated factor of project success in small construction companies. Van Tam et al. (2021) found out that BIM-related factors had a positive effect on construction project performance. Imam (2021) indicated that shared leadership, autonomy, and knowledge sharing had a positive influence on construction project success. Ingle and Mahesh (2021) discovered that project risk management had a positive impact on the performance. Assaad et al. (2020) revealed that project risk management had a significant effect on project success. Amoah and Pretorius (2020) showed that project risk management had a positive influence on project performance. Esa et al. (2020) found out that Covid-19 pandemic lockdown had a significant effect on project success. Alaloul et al. (2020) revealed that project risk management had a significant impact on construction project performance.

Cantillo and Van Caillie (2023) found out that project risk management had significant influence on project performance. Moreso, the study of Amani and Safarzadeh (2022) on project risk management in Iranian small construction firms, indicated that project risk management had significant effect on project performance. Bepari et al. (2022) study on a comparative study of project risk management with risk breakdown structure (RBS): A case of commercial construction in India, showed that project risk management had positive impact on project performance. Furthermore, Green and Dikmen (2022) study on the narratives of project risk management: From scientific rationality to the discursive nature of identity work, revealed that project risk management had significant effect on project performance. Testorelli and Verbano (2022) study on an empirical Framework to Sustain Value Generation with Project Risk Management: A Case Study in the IT Consulting Sector, found out that project risk management had positive and significant influence on project performance.

The study of Masár et al. (2022) on global survey of current barriers to project risk management and their impact on projects, discovered that project risk management positively influenced project performance. Alfreahat and Sebestyén (2022) examined construction specific extension to a standard project risk management process and discovered that project risk management had significant impact on project performance. Rane et al. (2021) investigating of the development of project risk management framework based on industry 4.0 technologies, indicated that project risk management had significant influence on project performance. Ferreira et al. (2021) study on successful implementation of project risk management in small and medium enterprises: A cross-case analysis, showed that project risk management had positive effect on project performance.

Conversely, Rahi (2021) study on do actual risk management practices address temporary multi-organizations' IT projects complexity, indicated that project risk management had negative and insignificant impact on project performance. Sundara et al. (2021) examined the effect of human resources and budget in project risk management for enterprise resource planning systems and discovered that project risk management affected enterprise resource

planning systems, negatively. Marle (2020) study on an assistance to project risk management based on complex systems theory and agile project management, indicated that project risk management had insignificant effect on project performance. The study of George (2020) on the essence of risk identification in project risk management: An overview, discovered that risk identification had negative influence on project risk management. Also, the study of Rishnyak et al. (2020) on the implementation models application for IT project risk management, indicated that project risk management had insignificant effect on project performance and Zhu et al. (2020) on incentive mechanisms in mega project-risk management considering owner and firms as principals, also affirms that project-risk management insignificant and negative effect on project performance.

Research Conceptual Model

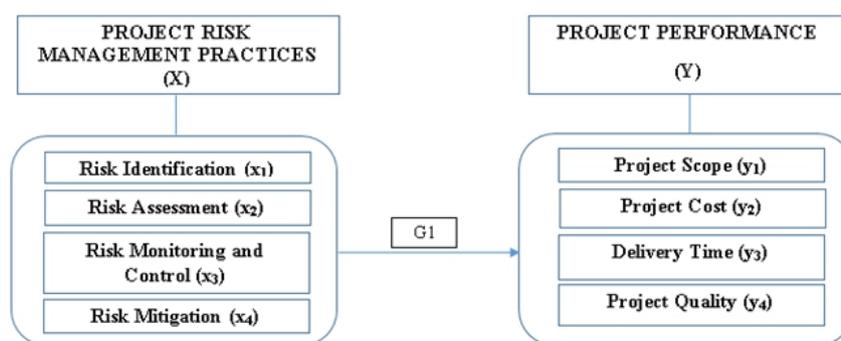The conceptual model for this study is diagrammatically shown below:

Figure 1: Research Conceptual Model (2023)

The conceptual model presented in Figure 1 presents the independent and dependent variables used in this study. The independent variable which is project risk management practices is represented by X and its sub-variables risk identification, risk assessment, risk monitoring and control, and risk mitigation is represented by x_1, x_2, x_3, and x_4 respectively. The dependent variable project performance is represented by Y with sub variables project scope, project cost, and project time and project quality represented by y_1, y_2, y_3 and y_4 respectively. The model further showed the interaction between project risk management practices that is risk identification, risk assessment, risk monitoring and control, and risk mitigation on project performance of the selected construction companies in Nigeria. In other words, this gap model showed that project risk management practices variables caused lack of project performance in the selected construction companies in Nigeria.

Theoretical Review

This study is anchored on contingency theory and the iron triangle theory. The Contingency Theory was formulated by Fred Fiedler in 1967. The contingency theory recognizes that there are a range of contextual variables (risks), each influencing the project that the theory is going to be applied to. Improvement in organizational risk management practices is what contingency theory aims at in order to respond to uncertainty in project performance.

Contingency is mainly generated for removing or decreasing the negative outcomes of unforeseen events. So, contingency theory is used in this study in order to describe an approach in managing risk of on projects that best suit the Nigeria's current construction company's situation. Thus, contingency theory helps in understanding project risk management practices and its effect on project performance.

Barnes developed the iron triangle theory in 1956. The iron triangle theory is also known as the golden triangle or the triple constraints theory (Scheuchner, 2017). The Iron Triangle was originally conceived as a framework to enable project managers to evaluate and balance the competing demands of Cost, Time and Quality within their projects (Atkinson, 1999). The iron triangle theory focus specifically on project time, cost, and scope. The iron triangle theory serves two purposes, the identification of the project success factors, which are time, cost, and scope and provisioned of a tool to measure project's performance based on the quality of time, cost, and scope. The iron triangle theory provides a dynamic way to approach priorities on a project and supports describing items of value in a project team. According to the iron triangle theory, the change that may happen to any of the three constraints of time, cost, and scope, will lead to a change occurring to the other two constraints. Thus, balancing the three project constraints of time, cost, and scope can help determine the quality of the overall project. In this regard, the contingency theory and the iron triangle theory are deemed suitable in studying the effect of project risk management practices on project performance as their perspectives are in line with the study variables investigated.

In summary, both contingency theory and the iron triangle theory are highly relevant in project risk management practices and have a significant impact on project performance. Contingency theory enables tailored risk management approaches, flexibility, stakeholder alignment, and adaptation to changing circumstances. The iron triangle theory guides scope, time, and cost management, trade-off decisions, and project control, ensuring project objectives are met efficiently. Integrating these theories into risk management practices enhances the likelihood of project success and improved overall performance.

Methodology

Survey research design was adopted. The population was 202 top management and mechanical department staff of three selected construction companies in Lagos State, Rivers State, and the Federal Capital Territory of Abuja, Nigeria. A sample size of 176 was found to be usable. A validated questionnaire was adopted for data collection. Cronbach's alpha reliability coefficients for the constructs ranged from 0.74 to 0.98. The response rate was 87.1%. Data were analyzed using the Smart partial least squares structural equation modeling (PLS-SEM) software, which allowed for the testing of path analysis and hypotheses. A confirmatory factor analysis (CFA) was employed to assess the factor loading of the variables. The principal factors investigated were measured on a six-point scale with anchors ranging from Very High (VH) to Very Low (VL), for the independent variables and dependent variable respectively. Multiple regression equation developed along the dependent and independent variables. Thus, the models can be represented as follows:

Variables Identification
For this study, the independent variable is project risk management practices measured by sub-variables of risk identification, risk assessment, risk monitoring and control and risk mitigation, while the dependent variable for this study is project performance measured by sub-variables of project scope, project cost, project time and project quality.

Functional Relationship
The functional model for the study variables is denoted in the equations below:
$Y = f(X)$
Y = Dependent Variable (Project Performance)
X = Independent Variable (Project Risk Management Practices)
$Y = (y_1, y_2, y_3, y_4)$ $X = (x_1, x_2, x_3, x_4)$

    Where: Where;

Y = Project Performance (PP) (PRMP)   X = Project Risk Management Practices (PRMP)

y_1 = Project Scope (PS) x_1 = Risk Identification (RI)

y_2 = Project Cost (PC) x_2 = Risk Assessment (RA)

y_3 = Project Time (PT) x_3 = Risk Monitoring and Control (RMC)

y_4 = Project Quality (PQ) x_4 = Risk Mitigation (RM)

Regression Model
The model formulated for each of the hypotheses are written as:

Hypothesis One
$Y = f(X)$
$PP = \beta_0 + \beta_1 PRMP\,(\beta_1 RI + \beta_2 RA + \beta_3 RMC + \beta_4 RM) + e_i$ ------------ Regression equation 1

Where:
β_0 = Intercept
β_{1-4} = Beta coefficients
e_i = error term

Data Analysis, Results and Discussion
A total of 202 copies of the questionnaire were administered to top management and mechanical department staff from three selected Nigerian construction companies operating in Abuja, Lagos, and Port Harcourt. Out of the 202 copies of the questionnaire that were distributed, 176 were correctly filled out and returned. This represented 87.1%. Bell et al. (2022) posited that a response rate of 50% is acceptable to analyze the results of the study. Therefore, a response rate of 87.1% was considered okay for this study.

Restatement of Research Objective, Research Question and Hypothesis One
Objective One: evaluated the effect of project risk management practices on project performance.

Research Question One: how does project risk management practices affect project performance?

The objective evaluated the effect of project risk management practices on project performance of selected construction companies in Nigeria. On a six-point Likert scale, the respondents were requested to rate their perception of various items about project risk management practices and project performance of selected construction companies in Nigeria. These points formed the weights for calculating the score for each item. The results are shown below with an analysis and interpretation.

Restatement of Hypothesis One
H01: Project risk management practices does not significantly affect project performance.

To test hypothesis, partial least square structural equation modelling (PLS-SEM) was deployed with project risk management practices as an independent variable and project performance as the dependent variable. The results of the analysis and parameter estimates obtained are presented below:

Figure 2 displays the outcomes of the bootstrapping procedure, illustrating the obtained results and their implications for the structural model analysis for objective five which is to evaluate the effect of project risk management practices on project performance.
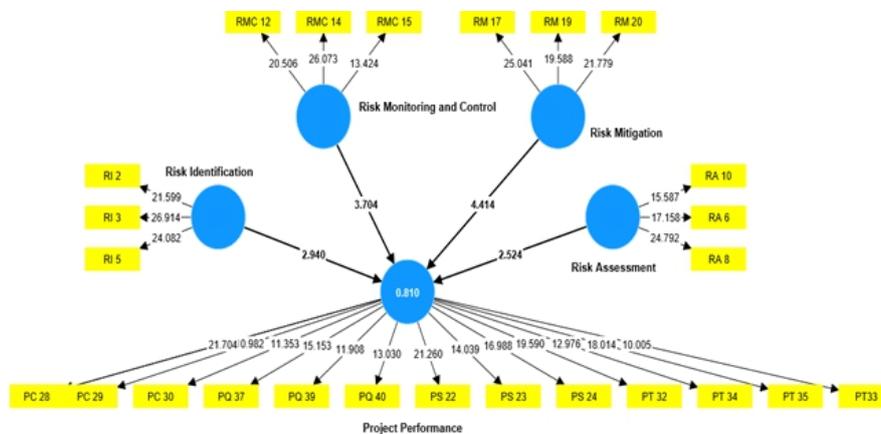

Figure 2: Bootstrapping Outcome for Project Risk Management Practices and Project Performance

The results of the structural equation modelling analysis showed a substantial overall effect size since it is above the moderate effect of 0.5, with an R^2 value of 0.815 and an Adjusted R2 value of 0.810 for project performance. This indicates a strong predictive power according to the classification by Hussain, et al. (2018), where an R^2 value of 0.75 is considered substantial, 0.50 is moderate, and 0.26 is weak. Furthermore, the structural model, Goodness of Fit: = 0.075; d_ULS = 1.973; d_G = 0.905; Chi-Square = 839.866; Normed Fit Index (NFI) = 0.672,

indicating an acceptable fit (Hair et al., 2014; Sanchez, 2013; Chin et al., 2020). The findings also, reveal that Risk Assessment (β = 0.167, t = 2.524, p = 0.012), Risk Identification (β = 0.168, t = 2.940, p = 0.008), and Risk Mitigation (β = 0.385, t = 4.414, p = 0.000) and Risk Monitoring and Control (β = 0.304, t = 3.704, p = 0.000) positively and significantly has effect on project performance of the chosen construction companies in Nigeria. The p-value indicates that the model successfully predicted the variables' outcomes. Finally, the Q^2 value measures whether a model has predictive relevance or not when > 0 indicates good predictive relevance. Q^2 according to Hair et al (2013) classified the degree of predictive relevance as 0.02, 0.15 and 0.35 as weak, moderate and strong respectively. The values of Q^2 PC 27 (0.472), PC 28(0.210), PC 29(0.256), PC 30(0.333), PQ 37(0.362), PQ 39(0.295), PQ 40(0.308), PS 22(0.476), PS 23(0.413), PS 24 (0.429), PT 32 (0.468), PT 34(0.264), PT 35(0.355), PT33(0.284), and Project Performance (0.790) for the endogenous variable were over 0, hence predictive relevance was achieved, and it has a strong predictive degree of relevance. Table 4.10a shows a summary of the path result obtained using SmartPLS.

Table 1.1a: Path analysis results for Project Risk Management Practices and Project Performance

Path	Beta	Standard Error	T Statistics	R^2	Adj.R^2	Prob	Decision
Risk Assessment -> Project Scope	0.167	0.066	2.524	0.815	0.810	0.012	Supported
Risk Identification -> Project Scope	0.168	0.057	2.940			0.003	Supported
Risk Mitigation -> Project Scope	0.385	0.087	4.414			0.000	Supported
Risk Monitoring and Control -> Project Scope	0.304	0.082	3.704			0.000	Supported

Source: Researchers' Findings 2023

In the same view, according to Cohen's f^2 value interpretation, can significantly show the effect size of the independent variable on the dependent variable. The Cohen value effect size classification can be interpreted as follows "0.02, 0.15, and 0.35 represent small, medium, and large effects", respectively (Hair et al., 2014). Table 1.1b shows the effect sizes of the variables.

Table 1.1b: Effect Size for Project Risk Management Practices

	F-Square (F^2)	Effect Size	97.5% CI
Risk Assessment -> Performance	0.072	Small	0.302
Risk Identification -> Performance	0.068	Small	0.282
Risk Mitigation -> Performance	0.301	Medium	0.554
Risk Monitoring and Control -> Performance	0.165	Medium	0.458

Note: CI is confidence Interval
Source: Researchers' Findings 2023

According to Hair et al. (2021), a significant effect is confirmed by a lack of zero in the confidence intervals for an estimated path coefficient leading to the rejection of the null. The

significance of the effect is confirmed when the confidence intervals for the estimated path coefficient do not include zero, leading to the rejection of the null hypothesis (Hair et al., 2014, 2021). Consequently, it is strongly advised that construction companies deliberately concentrate their efforts on risk identification, risk assessment, risk monitoring and control, and risk mitigation in order to enhance project performance and thus effectively practice risk management to improve project performance. The model equation is as follows:

$$PP = \beta 0 + 0.167RI + 0.168RA + 0.385RMC + 0.304RM + \varepsilon i \text{ -----------------------------Eqn1}$$

Where:
PP = Project Performance
RI= Risk Identification
RA = Risk Assessment
RMC = Risk Monitoring and Control
RM = Risk Mitigation
The path regression model above revealed that when combining all the dimensions of project risk management together as the independent variable, it positively and significantly predicted the project performance. Moreover, the unit of change in risk identification resulted in 0.167 improvements in the project performance reviews of the selected construction companies in Nigeria, keeping other variables constant. Likewise, a unit of change or increase in risk assessment would lead to a 0.168 improvement in the project performance. Also, a unit change in risk monitoring and control resulted in 0.385 improvements in the project performance, and a unit change in risk mitigation would lead to 0.304 improvements in the project performance in the same project construction market. Based on the results above, the null hypothesis that project risk management practices have no significant effect on project performance has no evidence to support it, therefore based on the path results, this study fail to accept the null hypothesis for hypothesis 1. This indicates that project risk management practices have a significant effect on project performance.

Discussion
The results of PLS-SEM path analysis for hypothesis one on the effect of project risk management practices (risk identification, risk assessment, risk monitoring and control and risk mitigation) on performance of selected construction companies in Nigeria revealed that project risk management practices have significant effect on project performance. This discovery has conceptual, empirical, and theoretical implications. In terms of conceptual implications, the definitions and explanations presented in this study provide a clear conceptual framework for understanding the research topic. Previous studies, such as Abal-Seqan et al (2023); Amoah and Pretorius (2020); Gransberg and Maraqa, 2022; Unegbu et al (2022) have also highlighted the conceptual relationship between project risk management practices and enhanced project performance.

The empirical findings of this study are consistent with previous studies that have also provided empirical evidence of the relationship between project risk management practices and project performance. Khahro, et al (2023) found out that project risk management had significant effect on construction project performance. Ojiako, et al (2023) indicated project

portfolio management practices had significant relationship between organizational ambidexterity and project performance success. Abal-Seqan, et al (2023) revealed that project success factors had significant impact on the performance of construction projects. Unegbu, et al (2022) showed a significant relationship between project performance measures and project management practices of construction projects for the construction industry in Nigeria. Sami et al (2022) indicated that project risk management had significant influence on project performance. Ingle and Mahesh (2022) found out that project risk management had significant impact on construction project performance.

The study of Alkilani and Loosemore (2022) further discovered that project performance measurement had a significant effect on the performance small-and-medium sized construction contractors. Klaus-Rosińska and Iwko (2021) revealed that stakeholder management had a positive influence on one of the clues of sustainable project management as an underestimated factor of project success in small construction companies. Van Tam, et al (2021) found out that BIM-related factors had a positive effect on construction project performance. Imam (2021) indicated that shared leadership, autonomy, and knowledge sharing had a positive influence on construction project success. Ingle and Mahesh (2021) discovered that project risk management had a positive impact on the performance. Assaad, et al (2020) revealed that project risk management had a significant effect on project success. Amoah and Pretorius (2020) showed that project risk management had a positive influence on project performance. Esa et al. (2020) found out that Covid-19 pandemic lockdown had a significant effect on project success. Alaloul et al. (2020) revealed that project risk management had a significant impact on construction project performance.

Cantillo and Van Caillie (2023) found out that project risk management had significant influence on project performance. Moreso, the study of Amani and Safarzadeh (2022) on project risk management in Iranian small construction firms, indicated that project risk management had significant effect on project performance. Bepari, et al (2022) study on a comparative study of project risk management with risk breakdown structure (RBS): A case of commercial construction in India, showed that project risk management had positive impact on project performance. Furthermore, Green and Dikmen (2022) study on the narratives of project risk management: From scientific rationality to the discursive nature of identity work, revealed that project risk management had significant effect on project performance. Testorelli and Verbano (2022) study on an empirical Framework to Sustain Value Generation with Project Risk Management: A Case Study in the IT Consulting Sector, found out that project risk management had positive and significant influence on project performance.

The study of Masár et al. (2022) on global survey of current barriers to project risk management and their impact on projects, discovered that project risk management positively influenced project performance. Alfreahat and Sebestyén (2022) examined construction specific extension to a standard project risk management process and discovered that project risk management had significant impact on project performance. Rane et al. (2021) investigating of the development of project risk management framework based on industry 4.0 technologies, indicated that project risk management had significant influence on project

performance. Ferreira et al. (2021) study on successful implementation of project risk management in small and medium enterprises: A cross-case analysis, showed that project risk management had positive effect on project performance.

Conversely, Rahi (2021) study on do actual risk management practices address temporary multi-organizations' IT projects complexity, indicated that project risk management had negative and insignificant impact on project performance. Sundara et al. (2021) examined the effect of human resources and budget in project risk management for enterprise resource planning systems and discovered that project risk management affected enterprise resource planning systems, negatively. Marle (2020) study on an assistance to project risk management based on complex systems theory and agile project management, indicated that project risk management had insignificant effect on project performance. The study of George (2020) on the essence of risk identification in project risk management: An overview, discovered that risk identification had negative influence on project risk management. Also, the study of Rishnyak et al. (2020) on the implementation models application for IT project risk management, indicated that project risk management had insignificant effect on project performance and Zhu et al. (2020) on incentive mechanisms in mega project-risk management considering owner and firms as principals, also affirms that project-risk management insignificant and negative effect on project performance.

Theoretical implications arise from the contribution of this study to the existing theories and models related to project risk management practices. By providing evidence of the link between project risk management practices and enhanced project performance, this study strengthens the theoretical foundations and understanding of how risk management contributes to project performance. This findings of the study are validated by contingency theory and the iron triangle theory which are essential in project risk management practices and have a direct impact on project performance. Contingency theory enables project managers to identify and assess project-specific risks, develop tailored risk response strategies, and maintain adaptability in the face of uncertainties. The iron triangle theory guides project managers in managing the interdependencies among scope, time, and cost, facilitating trade-off decisions and providing a framework for performance monitoring and control.

Integrating the contingency theory and the iron triangle theory into risk management practices, project managers can enhance project performance by effectively managing risks, maintaining alignment with project objectives, and adapting to changing circumstances. Overall, these implications emphasize the significance of project risk management practices in achieving project performance and reinforce the importance of considering risk management as an integral part of project risk management practice. Thus, considering the conceptual, empirical and theoretical assertion supporting this study finding that project risk management practices significantly affect project performance, therefore this study rejected the null hypothesis one (H_{01}) that project risk management practices (risk identification, risk assessment, risk monitoring and control and risk mitigation) have no significant effect on performance of selected construction companies in Nigeria.

Conclusion and Recommendations

This study examined the effect of project risk management practices on the performance of selected construction companies in Nigeria. From antecedents, the study discussed global trends and directions of performance within the project construction industry from a world view, African perspective, and concluded by looking at Nigeria. This then took into account the key problems faced by the construction industry and how they have affected the industry over the years. This study provided empirical evidence supporting the significant impact of project risk management practices on the performance of selected construction companies in Nigeria. The findings of the study revealed that project risk management practices have a significant effect on various aspects of project performance, including project scope, cost, time, and quality.

This study contributes to the existing body of knowledge in concepts, theory and empirics. The conceptual framework for project risk management practices and firm performance has contributed to theories in production and operations management science and other related fields. Hence, this study contributed to the body of knowledge conceptually because, according to extant literature, no known studies have utilized this study model in their investigations. Theoretically, findings of this study have provided evidence that support the underpinning theories (contingency theory and the iron triangle theory). Hence, future scholars can cite this work as a supporter of the contingency theory and the iron triangle theory. The result of this study also contributed empirically to the body of literature in project risk management practices and firm performance, which would and equally serve as a reference material for future researchers in production and operations management and other related fields.

Based on the findings of this study, it is recommended that prior to project initiation, project managers should conduct thorough risk identification, risk assessment, risk monitoring, and risk mitigation to analyze potential risks to project performance and consider both internal and external factors that may influence project performance. Future studies should explore the mediating and moderating factors that may influence the relationship between project risk management practices and construction project performance. This could include investigating the role of organizational culture, project complexity, stakeholder engagement, or project team dynamics in shaping the effectiveness of risk management practices.

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