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EFFECT OF RISK MANAGEMENT PRACTICES ON COST-EFFECTIVENESS OF MOBILE NETWORK OPERATORS IN THE NIGERIAN TELECOMMUNICATION INDUSTRY: THE MODERATING ROLE OF COMMUNICATION AND CONSULTATION

EFEITO DAS PRÁTICAS DE GESTÃO DE RISCOS NA CUSTO-EFETIVIDADE DAS OPERADORAS DE REDES MÓVEIS NA INDÚSTRIA DE TELECOMUNICAÇÕES DA NIGÉRIA: O PAPEL MODERADOR DA COMUNICAÇÃO E CONSULTA

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Abstract
This study examined the effect of risk management practices on the cost-effectiveness of Mobile Network Operators (MNOs) in the Nigerian telecommunication industry, with communication and consultation as a moderating variable. The study was anchored on the Enterprise Risk Management framework and adopted a descriptive survey research design. Data were collected from employees of selected MNOs in Nigeria, including MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, 9mobile, NATCOM Development & Investment Ltd., and Mafab Communications Limited. A structured four-point Likert scale questionnaire was used as the primary instrument for data collection. The study employed Structural Equation Model (SEM) using SmartPLS 4 to analyse the relationship among risk identification, risk assessment, risk evaluation, risk mitigation, risk monitoring, communication and consultation, and cost-effectiveness. The findings revealed that communication and consultation had a significant positive effect on cost-effectiveness, while risk identification also significantly improved cost-effectiveness. However, risk assessment, risk evaluation, risk monitoring, and risk mitigation had insignificant effects. The

Resumo
Este estudo examinou o efeito das práticas de gestão de riscos na custo-efetividade das Operadoras de Redes Móveis (MNOs) na indústria de telecomunicações da Nigéria, tendo a comunicação e consulta como variável moderadora. O estudo baseou-se no modelo de Gestão de Riscos Empresariais e adotou um desenho de pesquisa de levantamento descritivo. Os dados foram coletados de funcionários de MNOs selecionadas na Nigéria, incluindo MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, 9mobile, NATCOM Development & Investment Ltd. e Mafab Communications Limited. Um questionário estruturado em escala Likert de quatro pontos foi utilizado como principal instrumento de coleta de dados. O estudo empregou o Modelo de Equações Estruturais (SEM), utilizando o SmartPLS 4, para analisar a relação entre identificação de riscos, avaliação de riscos, análise de riscos, mitigação de riscos, monitoramento de riscos, comunicação e consulta, e custo-efetividade. Os resultados revelaram que a comunicação e consulta tiveram um efeito positivo significativo sobre a custo-efetividade, enquanto a identificação de riscos também melhorou significativamente a custo-efetividade. No entanto, a avaliação de riscos,

moderation result showed that communication and consultation significantly moderated the relationship between risk identification and cost-effectiveness. The study recommends timely communication, proactive risk identification, and stronger integration of risk practices into cost-control decisions.

Keywords: Risk Management. Cost-Effectiveness. Communication and Consultation. Mobile Network Operators. Nigeria.

análise de riscos, monitoramento de riscos e mitigação de riscos apresentaram efeitos insignificantes. O resultado da moderação mostrou que a comunicação e consulta moderaram significativamente a relação entre identificação de riscos e custo-efetividade. O estudo recomenda comunicação oportuna, identificação proativa de riscos e uma integração mais forte das práticas de risco nas decisões de controle de custos..

Palavras-chave: *Gestão de Riscos. Custo-Efetividade. Comunicação e Consulta. Operadoras de Redes Móveis. Nigéria.*

1 INTRODUCTION

The Nigerian telecommunication industry is one of the most strategic sectors of the economy because it supports digital communication, financial technology, e-commerce, education, security, public administration, and social interaction. Mustapha *et al*. (2023) established that risk management practices significantly influence organizational performance, which makes risk management relevant to Mobile Network Operators (MNOs) such as MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, Emerging Markets Telecommunications Services Ltd. (9mobile), NATCOM Development & Investment Ltd., and Mafab Communications Limited. These firms play a central role in sustaining connectivity and digital inclusion across the country. However, they are exposed to infrastructure vandalism, network failures, foreign exchange instability, regulatory changes, cybersecurity threats, energy cost volatility, competition, customer churn, and technological disruption. Egiyi and Eze (2022) found that risk analysis, evaluation, threat assessment, and monitoring improve organizational efficiency, suggesting that structured risk management can reduce inefficiencies arising from these risks. Since such risks can increase operating costs, reduce service quality, weaken profitability, and affect overall performance, risk management practices have become essential managerial tools for improving cost-effectiveness and sustaining operational performance among MNOs in Nigeria. This position is further supported by Baltas and Liñares-Zegarra (2025), who linked cost efficiency with stronger financial risk management outcomes, and Oreshile *et al*. (2026), who found that high-quality enterprise

risk management reduces financial distress among African firms.

Risk management practices involve systematic processes through which organizations identify, analyse, evaluate, mitigate, monitor, and review risks that may affect their objectives. Gharaibeh (2019) showed that applying risk management helps organizations reduce delays, avoid cost overruns, and improve stakeholder communication. In the context of MNOs, risk identification helps firms detect threats to network operations, financial stability, regulatory compliance, and customer satisfaction, while risk analysis enables managers to determine the nature, source, likelihood, and consequences of identified risks. Mwangi and Ngugi (2018) emphasized that risk management practices influence project performance and that proper planning, design, legal compliance, and stakeholder involvement are important in reducing implementation risks. Risk evaluation assists in ranking risks according to severity and urgency, risk mitigation involves selecting and implementing appropriate responses to reduce risk impact, and monitoring and review ensure that adopted strategies remain effective over time. Egiyi and Eze (2022) confirmed that risk evaluation and monitoring significantly improve organizational efficiency, while Nguyen *et al*. (2026) found that sustainable risk management contributes positively to sustainability performance. Therefore, in a dynamic and capital-intensive industry such as telecommunications, these practices are expected to improve cost-effectiveness by reducing avoidable losses, preventing service disruptions, improving resource allocation, and strengthening operational resilience.

Despite the importance of risk management, Nigerian MNOs continue to face rising operational costs, infrastructure maintenance challenges, regulatory pressures, network downtime, energy supply problems, and increasing security-related expenses. Mwangi and Ngugi (2018) demonstrated that weak or poorly coordinated risk management practices can affect project performance, which implies that similar weaknesses may undermine cost-effectiveness in telecommunications. These challenges suggest that the cost-effectiveness of mobile network operations may depend significantly on how well risk management practices are implemented. Many firms may identify risks but fail to analyse them properly, evaluate their severity, or monitor mitigation strategies consistently. Gharaibeh (2019) observed that risk management improves communication among stakeholders and supports early mitigation planning, indicating that poor communication may weaken risk response. In addition, limited consultation among

departments, regulators, technical teams, suppliers, and other stakeholders may reduce the effectiveness of risk management practices. Oko-Odion and Angela (2025) argue that organizations require flexible risk management frameworks to navigate regulatory changes, market volatility, and emerging risks, while Arnaudova *et al*. (2025) show that reactive risk management can weaken long-term resilience. The research problem, therefore, lies in the need to empirically determine whether risk identification, risk analysis, risk evaluation, risk mitigation, and monitoring and review significantly affect the cost-effectiveness of MNOs in Nigeria, and whether communication and consultation moderate this relationship.

The motivation for this study arises from the need to improve the performance and sustainability of MNOs in Nigeria's rapidly changing telecommunications environment. Gharaibeh (2019) showed that effective risk management helps minimize cost overruns and project delays, which is relevant to MNOs that must manage high infrastructure and operational costs. As customers demand better service quality, regulators impose stricter compliance requirements, and firms invest heavily in digital infrastructure, MNOs must manage risks more effectively to remain cost-efficient and competitive. Previous studies on risk management have focused largely on construction, banking, insurance, microfinance, public corporations, ESG, and general organizational performance, while limited attention has been given to the Nigerian telecommunications industry. Yahaya (2026) examined credit risk management in Nigerian banks, while Horvey and Odei-Mensah (2025) focused on insurers' risk-taking behaviour, showing that existing empirical attention is concentrated in financial and insurance settings. Also, many studies have examined financial performance broadly, but fewer have focused specifically on cost-effectiveness as a performance indicator. Baltas and Liñares-Zegarra (2025) examined cost efficiency in microfinance institutions, while Aloulou and Alshohail (2026) focused on operational efficiency in Saudi technology-driven firms. Therefore, this study is motivated by the need to fill this sectoral and conceptual gap by examining risk management practices within MNOs, where operational risks directly influence cost structures and service delivery.

The broad objective of the study is to examine the effect of risk management practices on the performance of Mobile Network Operators in Nigeria, with emphasis on cost-effectiveness. Egiyi and Eze (2022) found that risk analysis, risk evaluation, threat

assessment, and monitoring significantly affect organizational efficiency, thereby supporting the need to assess individual dimensions of risk management. Specifically, the study seeks to assess the effect of risk identification on the cost-effectiveness of MNOs in Nigeria; analyse the effect of risk analysis on cost-effectiveness; evaluate the effect of risk evaluation on cost-effectiveness; investigate the effect of risk mitigation on cost-effectiveness; assess the effect of monitoring and review on cost-effectiveness; and analyse the moderating effect of communication and consultation on the relationship between risk management practices and cost-effectiveness. Mustapha *et al*. (2023) linked risk management practices with organizational performance in Nigeria, while Baltas and Liñares-Zegarra (2025) associated cost efficiency with improved financial risk management outcomes. Oreshile *et al*. (2026) further confirmed that high-quality enterprise risk management reduces financial distress among African firms. Thus, the objectives provide a structured basis for understanding how different dimensions of risk management contribute to improved cost performance in the Nigerian telecommunication industry.

This study is expected to make theoretical, empirical, and practical contributions. Gharaibeh (2019) identified improved stakeholder communication as one of the major benefits of risk management, while Mwangi and Ngugi (2018) emphasized stakeholder involvement in planning and risk mitigation. Theoretically, the study contributes to the literature on risk management and organizational performance by extending the discussion to cost-effectiveness within the Nigerian telecommunications sector. Empirically, it provides evidence on the individual effects of risk identification, risk analysis, risk evaluation, risk mitigation, and monitoring and review on cost-effectiveness among MNOs. It also contributes by introducing communication and consultation as a moderating variable, thereby showing whether effective information sharing and stakeholder engagement strengthen the influence of risk management practices on cost performance. Soi *et al*. (2026) found that audit committee expertise and meetings with substantive risk agenda improve risk management effectiveness, while Al-Hajaya (2026) showed that risk management committees strengthen governance-related risk outcomes. Practically, the findings will benefit managers, risk officers, regulators, policymakers, investors, and other stakeholders by providing insights into how MNOs can reduce unnecessary costs, improve operational resilience, and enhance sustainable performance

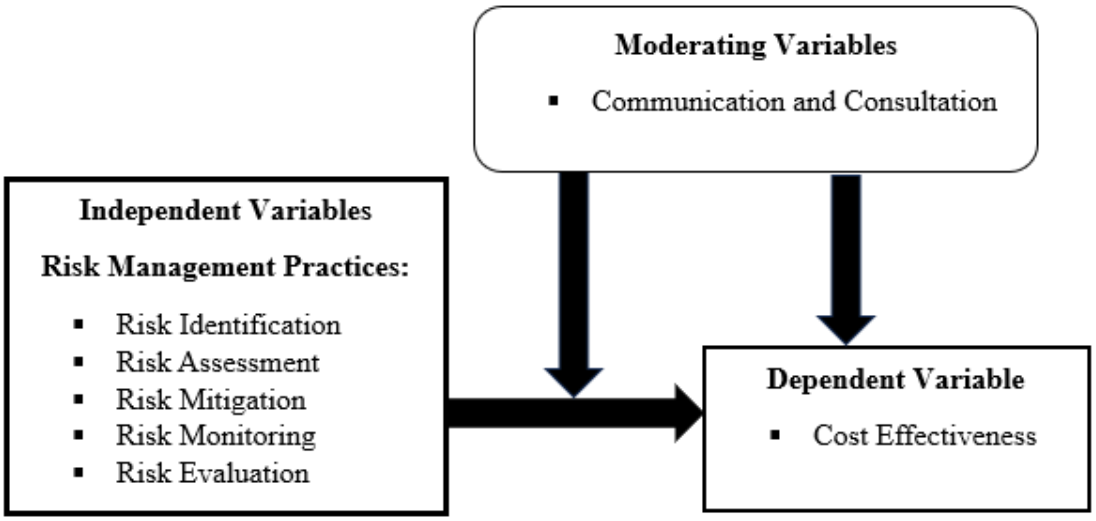
through effective risk management systems.

The scope of the study is limited to selected Mobile Network Operators operating in Nigeria, namely MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, Emerging Markets Telecommunications Services Ltd. (9mobile), NATCOM Development & Investment Ltd., and Mafab Communications Limited. Nguyen *et al*. (2026) found that sustainable risk management improves organizational sustainability performance, supporting the relevance of examining risk management in a complex and technology-driven sector such as telecommunications. The study focuses on risk management practices as the independent variables, measured through risk identification, risk analysis, risk evaluation, risk mitigation, and monitoring and review. Cost-effectiveness serves as the dependent variable, while communication and consultation serves as the moderating variable. The justification for the study is based on the strategic role of telecommunications in Nigeria's economic development and the need for MNOs to manage risks in ways that reduce costs and improve performance. Mustapha *et al*. (2023) provide evidence that risk management improves organizational performance, while Oreshile *et al*. (2026) show that enterprise risk management reduces financial distress in African firms. Aloulou and Alshohail (2026) also link governance, risk management, and compliance practices with operational efficiency. By focusing on cost-effectiveness, the study provides a practical basis for improving decision-making, resource utilization, and long-term competitiveness in the Nigerian telecommunication industry.

1.1 Conceptual framework

Figure 1

Conceptual Framework



Source: Authors' Compilation 2026

The conceptual framework for this study explains the relationship between risk management practices and cost-effectiveness among Mobile Network Operators (MNOs) in Nigeria, with communication and consultation serving as a moderating variable. The dependent variable is cost-effectiveness, which reflects the ability of MNOs to reduce avoidable costs, improve resource utilization, minimize operational losses, and achieve efficient service delivery. The independent variables are risk identification, risk assessment, risk mitigation, risk monitoring, and risk evaluation. Risk identification enables firms to detect threats that may affect operations, while risk assessment determines the likelihood and impact of such risks. Risk evaluation supports the prioritization of risks, risk mitigation involves actions taken to reduce risk effects, and risk monitoring ensures continuous review of risk responses. This framework is consistent with the Enterprise Risk Management perspective, which emphasizes integrated risk processes for achieving organizational objectives (COSO, 2004, 2017). Empirical studies also support the relationship between risk management and performance outcomes, as Mustapha *et al*. (2023) found that risk management practices significantly affect organizational performance, while Egiyi and Eze (2022) established that risk analysis,

evaluation, threat assessment, and monitoring improve organizational efficiency. Communication and consultation moderate the relationship by strengthening information sharing, stakeholder participation, coordination, and decision-making across functional units, thereby enhancing the effect of risk management practices on cost-effectiveness (Gharaibeh, 2019; Mwangi & Ngugi, 2018).

2 LITERATURE REVIEW

The study is anchored on the Enterprise Risk Management (ERM) framework, which originated from the work of the Committee of Sponsoring Organizations of the Treadway Commission (COSO). COSO formally advanced ERM in its Enterprise Risk Management—Integrated Framework, published in 2004, where ERM was presented as a structured, organization-wide process for identifying potential events that may affect an entity and managing risks within its risk appetite to provide reasonable assurance regarding the achievement of objectives (COSO, 2004). The framework was later updated as Enterprise Risk Management—Integrating with Strategy and Performance, which emphasized the integration of risk management with strategy-setting, performance, governance, and value creation (COSO, 2017). The ERM framework supports the view that risk management should not be treated as an isolated departmental function but as an organization-wide process embedded in strategy, governance, and performance management. This aligns with the findings of Mustapha *et al*. (2023), who established that risk management practices significantly influence organizational performance in Nigeria, and Oreshile, Zainudin, and Mahdzan (2026), who found that high-quality ERM reduces financial distress among African firms.

The ERM framework provides the theoretical foundation for examining how risk identification, risk analysis, risk evaluation, risk mitigation, and monitoring and review affect the cost-effectiveness of Mobile Network Operators (MNOs) in Nigeria. It is suitable for this study because MNOs operate in a complex, capital-intensive, and highly regulated environment involving financial, operational, technological, regulatory, cybersecurity, and market risks that require coordinated enterprise-wide management. The framework also supports the inclusion of communication and consultation as a moderating variable because effective risk management depends on timely sharing of

risk-related information among stakeholders. Shah *et al*. (2025) showed that ERM enhanced green growth through improved ESG risk management, while Horvey and Odei-Mensah (2025) demonstrated that ERM influenced risk-taking behaviour in South African insurers.

Empirical studies on risk management practices have generally shown that effective risk identification, risk analysis, risk evaluation, risk monitoring, and risk response improve organizational outcomes, especially where firms operate in uncertain and capital-intensive environments. In the construction sector, Gharaibeh (2019) found that applying risk management in Jordanian construction projects helped firms reduce delays, minimize cost overruns, and improve stakeholder communication. Similarly, Mwangi and Ngugi (2018), in their study of construction projects in Nairobi City County, Kenya, established that design risk management positively influenced project performance, although legal, construction, and contract risk practices showed mixed effects. In Nigeria, Egiyi and Eze (2022) reported that risk analysis, risk evaluation, risk threat assessment, and risk monitoring significantly improved organizational efficiency, suggesting that structured risk management can support better resource utilization. Mustapha *et al*. (2023) also found that risk management practices had significant effects on financial and non-financial performance in Nigerian organizations, with business model innovation partly explaining the relationship between risk management and performance.

Evidence from financial and service-based industries further demonstrates that risk management practices can enhance cost efficiency, financial stability, and long-term organizational value. Baltas and Liñares-Zegarra (2025) found that cost-efficient microfinance institutions were better positioned to improve asset quality and solvency while reducing excess liquidity holdings. Yahaya (2026) established that credit risk management practices in Nigerian banks had a negative short-term effect on return on assets but a positive effect on Tobin's Q, indicating that markets reward prudent risk management through higher firm valuation. Oreshile, Zainudin, and Mahdzan (2026) reported that high-quality enterprise risk management reduced the likelihood and severity of financial distress among firms in sub-Saharan Africa. Similarly, Oko-Odion and Angela (2025) emphasized that modern financial institutions require flexible risk management frameworks to respond to market volatility, regulatory changes, cyber risks,

and operational disruptions.

Recent empirical studies have also linked enterprise risk management to sustainability, governance, and strategic performance outcomes. Shah *et al*. (2025) found that enterprise risk management for ESG-related risks significantly promoted green growth among Malaysian oil and gas companies, especially through environmental and resource productivity. Kouloukoui *et al*. (2025) showed that climate risk management was influenced by firm size, industry profile, regulation, creditor power, auditor power, and profitability, indicating that risk management is shaped by both internal and external stakeholder pressures. Zhang (2025) found that ESG performance significantly improved financial performance among Chinese listed firms, while financing constraints moderated this relationship. Darsono *et al*. (2025) further demonstrated that independent assurance strengthened the relationship between ESG disclosure, financial performance, and cost of debt, suggesting that credible communication of risk-related information improves stakeholder confidence.

Studies focusing on governance structures suggest that risk management effectiveness depends not only on formal practices but also on oversight, consultation, and institutional communication mechanisms. Horvey and Odei-Mensah (2025) found that enterprise risk management and corporate governance influenced insurers' risk-taking behaviour in South Africa, with evidence of both linear and non-linear effects. Yahaya (2026) showed that the presence of a risk management committee significantly improved earnings quality among Nigerian listed firms by reducing discretionary accruals. Al-Hajaya (2026) found that risk management committees strengthened the relationship between ESG performance and corruption risk management among GCC firms. Toumeh and Ghazalat (2026) also reported that mandatory governance and risk management committees positively affected firm performance in Jordan's non-financial sector, confirming the importance of formal risk oversight structures.

Technology-oriented studies have extended the risk management debate by showing how digital capabilities, analytics, and information systems improve risk prediction and organizational resilience. Shi *et al*. (2025) developed a hybrid financial risk prediction model using convolutional neural networks and long short-term memory networks, showing substantial reductions in credit, liquidity, market, and operational risks. Yue (2025) proposed a time-series nested reinforcement learning algorithm for

dynamic risk control in nonlinear financial markets and found improved performance in high-volatility environments. Nguyen, Abu Afifa, Thi Truc Dao, Van Bui, and Vo Van (2026) found that business intelligence positively influenced sustainable risk management and sustainability performance, while information technology governance moderated the link between business intelligence and sustainable risk management. Aloulou and Alshohail (2026) also found that governance, risk management, and compliance practices improved operational efficiency and corporate reputation among Saudi technology-driven firms, although risk management did not significantly mediate the efficiency–reputation relationship.

The role of communication and consultation is particularly relevant because risk management is rarely effective when treated as a purely technical or compliance-based activity. Gharaibeh (2019) identified improved communication among stakeholders as one of the most important benefits of risk management in construction projects, as communication supported early identification of risks and better mitigation planning. Mwangi and Ngugi (2018) also emphasized stakeholder involvement in project planning and formulation as necessary for effective risk mitigation. Soi, Mzenzi, and Suluo (2026) found that audit committee expertise and meetings with substantive risk agendas positively influenced the effectiveness of risk management practices in Tanzanian public statutory corporations. Nguyen (2026) further showed that risk management planning could reduce the negative influence of risk perception on innovation creation, implying that consultation, planning, and information sharing are important for converting risk awareness into productive organizational action.

Despite these contributions, important gaps remain in the literature on the effect of risk management practices on cost-effectiveness of mobile network operators in the Nigerian telecommunication industry, with communication and consultation as a moderating variable. First, most existing studies have focused on construction, banking, insurance, microfinance, public corporations, ESG, and general organizational performance, with limited empirical attention to mobile network operators and the Nigerian telecommunication sector (Gharaibeh, 2019; Mwangi & Ngugi, 2018; Yahaya, 2026; Oreshile *et al*., 2026). Second, many studies measured performance using broad financial indicators such as ROA, Tobin’s Q, solvency, sustainability performance, or organizational efficiency, while fewer studies directly examined cost-effectiveness as an

outcome of risk management practices (Baltas & Liñares-Zegarra, 2025; Mustapha *et al*., 2023; Egiyi & Eze, 2022; Aloulou & Alshohail, 2026). Third, although some studies recognize communication, stakeholder involvement, committee meetings, and consultation as important for risk effectiveness, few have tested communication and consultation as a formal moderating variable in the relationship between risk management practices and cost-effectiveness (Gharaibeh, 2019; Mwangi & Ngugi, 2018; Soi *et al*., 2026; Nguyen *et al*., 2026). Therefore, the present study addresses these gaps by examining how risk management practices affect cost-effectiveness among Nigerian mobile network operators and by determining whether communication and consultation strengthen or weaken this relationship.

3 METHODOLOGY

This research adopted a descriptive survey research design to examine the effect of risk management practices on the cost-effectiveness of Mobile Network Operators in Nigeria. This design is consistent with prior empirical studies that used questionnaire-based quantitative approaches to assess risk management and performance outcomes, including Mustapha *et al*. (2023), Egiyi and Eze (2022), Soi *et al*. (2026), and Nguyen *et al*. (2026).

Data were collected from employees of selected Mobile Network Operators, including MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, 9mobile, NATCOM Development & Investment Ltd, and Mafab Communications Limited. A structured four-point Likert scale questionnaire was used to obtain responses on risk identification, analysis, evaluation, mitigation, monitoring, communication, consultation, and cost-effectiveness, providing evidence on risk management practices in the Nigerian telecommunication industry.

3.1 Population, sample and sampling technique

The sample size is the part of the population that was selected for the study. Krejcie & Morgan's (1970) sample size determination is handy since the population is above 10,000. The formula is presented as follows:

$$\frac{x^2\ N\ P\ (1-P)}{e^2(N-1)+x^2P(1-P)} \qquad (1)$$

x^2 is the Chi-Square;
e represents the Margin of error;
N stands for the Population,
while P represent the Proportion of the Population.

where

N=95,720, P=0.5 and e=0.05. At 95% confidence level with a degree of freedom 1, the chi-square x^2=3.841

$$= \frac{\frac{3.841 * 95{,}720 * 0.6 * 0.4}{0.05^2 * (95{,}720 - 1) + (3.841 * 0.6 * 0.4)}}{} = \frac{88{,}238.5248}{0.0025 * 95{,}719 + 0.92184} = \frac{88{,}238.5248}{239.2975 + 0.92184} \qquad (2)$$

$$\frac{88{,}238.5248}{240.21934} = 367.32 = 368\ approx$$

To increase the response rate, 30% of the respondents are included to make the total sample size 479. The designated organizations were properly represented using the proportionality formula.

Table 1

Sample Distribution

S/No	Companies	Population	Sample
1	MTN Nigeria Plc	26,779	$\frac{26,779}{95,720} * 479 = 134$
2	Globacom Ltd	29,518	$\frac{29,518}{95,720} * 479 = 148$
3	Airtel Nigeria	13,302	$\frac{13,302}{95,720} * 479 = 67$
4	Emerging Markets Telecommunications Services Ltd (9 Mobile),	10,947	$\frac{10,947}{95,720} * 479 = 55$
5	NATCOM Development & Investment Ltd	9,920	$\frac{9,920}{95,720} * 479 = 50$
6	Mafab Communications Limited.	5,254	$\frac{5,254}{95,720} * 479 = 27$
	Total	95,720	479

Source: Researcher Computation (2026)

This study adopts a multistage sampling technique involving purposive and stratified sampling. Purposive sampling is used to select six Nigerian Mobile Network Operators: MTN Nigeria Plc, Globacom Ltd, Airtel Nigeria, 9mobile, NATCOM Development & Investment Ltd, and Mafab Communications Limited. Stratified sampling is then applied across key departments such as risk management, finance, audit, operations, IT, and legal units. Respondents are randomly selected within each stratum to ensure representativeness, reduce bias, and support reliable analysis of risk management practices.

3.2 Model specifications

This research follows the model of Mwangi & Ngugi (2018) which examined the effect of risk management practices on the performance of construction projects. The following algebraic expression of the analytical model will be applied:

$$Perf = f(RI, RA, RT, RM) \qquad (2)$$

where

Perf represents organisational performance,

RI is Risk identification,

RA stands for Risk assessment,

RT represents Risk mitigation and

RM means Risk monitoring. Augmenting the equation and presenting it in econometric form would have:

$$PC_i = \theta_1 + \beta_1 RI_i + \beta_2 RA_i + \beta_3 RT_i + \beta_4 RM_i + \varepsilon_i \quad (3)$$

PC represents Cost performance (Cost Effectiveness); θ is the constant, β_1 to β_4 are parameters to be estimated while ε = Error term, which is assumed to be normally distributed.

Risk Evaluation (RE) is included as an independent variable because it strengthens the effectiveness of risk management practices by linking risk identification, assessment, mitigation, and monitoring with response prioritisation. It assesses the severity and likelihood of risks, thereby supporting strategic decision-making and improving financial and operational outcomes. Mwangi and Ngugi (2018) support expanding traditional risk management models to capture important dimensions such as risk evaluation. Communication and consultation (CC) is included as a moderating variable because it can strengthen or weaken the relationship between risk management practices and cost performance by enhancing information sharing, stakeholder participation, decision quality, and uncertainty reduction.

$$PC_i = \theta_1 + \beta_1 RI_i + \beta_2 RA_i + \beta_3 RT_i + \beta_4 RM_i + \beta_5 RE_i + \beta_6 CC_i + \beta_7 RMP_i * CC_i + \varepsilon_i \quad (4)$$

3.3 Estimation technique

Structural Equation Model (SEM) is the estimation technique adopted for this study because it allows the simultaneous examination of relationships among multiple independent, dependent, and moderating variables. The origin of SEM can be traced to Sewall Wright's development of path analysis, especially his work on causal modelling and path coefficients (Wright, 1921). SEM later evolved through the integration of path analysis, factor analysis, and simultaneous equation modelling, making it suitable for

analysing complex models involving latent and observed variables (Jöreskog, 1970; Kline, 2016). In this study, SEM is appropriate because risk management practices are multidimensional, covering risk identification, risk analysis, risk evaluation, risk mitigation, and monitoring and review, all of which are expected to influence cost-effectiveness among Mobile Network Operators in Nigeria.

SEM is also suitable because the study uses a structured four-point Likert scale questionnaire to measure constructs that are not directly observable, such as risk management practices, communication and consultation, and cost-effectiveness. The technique enables the researcher to test reliability, convergent validity, and discriminant validity before estimating the structural relationships among variables, thereby reducing measurement error and improving the robustness of findings (Byrne, 2016; Hair *et al*., 2019). It is also appropriate for testing the moderating role of communication and consultation in the relationship between risk management practices and cost-effectiveness. This aligns with Mustapha *et al*. (2023), who used PLS-SEM to examine risk management and organizational performance, and Nguyen *et al*. (2026), who applied PLS-SEM to assess sustainable risk management and performance relationships.

4 RESULTS AND DISCUSSIONS

Table 2 shows that 479 copies of the questionnaire were distributed, while 450 were completed and returned, giving a response rate of 93.95%. This high response rate indicates that the data collected were adequate and reliable for analysis. The gender distribution shows that 240 respondents, representing 53.33%, were male, while 210 respondents, representing 46.67%, were female. This implies that both male and female employees were fairly represented, although male respondents were slightly higher. In terms of age, 170 respondents, representing 37.78%, were within 18–30 years, while 155 respondents, representing 34.44%, were within 31–40 years. Also, 80 respondents, representing 17.78%, were aged 41–50 years, 30 respondents, representing 6.67%, were aged 51–60 years, and 15 respondents, representing 3.33%, were 60 years and above. This indicates that most respondents were within the active working-age categories.

Table 2

Questionnaire Distribution and Demographic Analysis

1	Distribution	Distributed 479	Percentage 100%	Received 450		Percentage 93.95%
2	Gender		Male 240	% 53.33	Female 210	% 46.67
3	Age	18-30 170	31-40 155	41-50 80	51-60 30	60 & above 15
4	Education	O'level 30	ND/NCE 45	HND/BSc 245	MA/MSc 115	Ph.D. 15
5		< 1 year 90	1-5 years 180	6-10 years 90	11-15 years 60	16 & above 30

Source: Author's Compilation

The educational distribution shows that 30 respondents, representing 6.67%, had O'level qualifications, 45 respondents, representing 10.00%, had ND/NCE, 245 respondents, representing 54.44%, had HND/BSc, 115 respondents, representing 25.56%, had MA/MSc, while 15 respondents, representing 3.33%, had Ph.D. qualifications. This suggests that most respondents were well educated and capable of providing informed responses on risk management practices and cost-effectiveness. In terms of work experience, 90 respondents, representing 20.00%, had less than one year of experience, 180 respondents, representing 40.00%, had 1–5 years, 90 respondents, representing 20.00%, had 6–10 years, 60 respondents, representing 13.33%, had 11–15 years, and 30 respondents, representing 6.67%, had 16 years and above. This shows that the study captured both new and experienced employees.

4.1 Descriptive and correlation analyses

Table 3 presents the descriptive statistics for communication and consultation (CC), cost-effectiveness (CE), risk assessment (RA), risk evaluation (RE), risk identification (RI), risk monitoring (RM), and risk mitigation (RT), based on 450 observations. The mean values range from 3.265 to 3.307, indicating that respondents generally agreed that the selected Mobile Network Operators apply risk management practices and cost-effectiveness measures to a high extent. Risk identification recorded the highest mean value of 3.307, followed by cost-effectiveness with 3.305 and risk evaluation with 3.302, suggesting that respondents placed strong emphasis on identifying

and evaluating risks as part of operational performance. The standard deviation values are relatively low, ranging from 0.381 to 0.484, which indicates that the responses were not widely dispersed from the mean. The skewness values are generally close to zero, although cost-effectiveness is moderately positively skewed at 0.500, while risk identification and risk monitoring are slightly negatively skewed. The Cramér-von Mises p-values are all 0.000, suggesting that the variables are not normally distributed. However, since SmartPLS uses a variance-based SEM approach, normality is not a strict requirement for analysis.

Table 3

Descriptive Statistics

Variables	CC	CE	RA	RE	RI	RM	RT
Mean	3.265	3.305	3.29	3.302	3.307	3.297	3.278
Median	3.207	3.126	3.194	3.196	3.246	3.118	3.244
Observed min	1.988	2.332	2	1.492	1.521	0.967	1.569
Observed max	4	4	4	4	4	4.18	4
Standard deviation	0.391	0.424	0.401	0.381	0.444	0.484	0.401
Excess kurtosis	0.182	-1.068	-0.272	0.657	-0.185	0.43	0.77
Skewness	-0.056	0.5	0.202	0.197	-0.225	-0.156	-0.056
Number of observations used	450	450	450	450	450	450	450
Cramér-von Mises test statistic	1.425	5.553	2.16	3.256	1.001	3.216	1.607
Cramér-von Mises p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: CC-communication and consultation, CC-Cost Effectiveness, RA-Risk assessment, RE-Risk Evaluation, RI-Risk identification, RM-Risk monitoring and RT-Risk mitigation
Sources: Author's Computation using SmartPLS 4

Table 4 shows the correlation matrix among the study variables. The results indicate that all variables are positively correlated, suggesting that increases in risk management practices are associated with improvements in cost-effectiveness and communication and consultation. The relationship between communication and consultation and cost-effectiveness is positive but weak at 0.160, indicating that communication and consultation alone may not strongly explain cost-effectiveness but may still play a supporting or moderating role. Cost-effectiveness also shows weak positive correlations with risk assessment (0.160), risk evaluation (0.165), risk identification (0.189), risk monitoring (0.140), and risk mitigation (0.148). Stronger relationships are observed among the risk management dimensions themselves, especially

between risk monitoring and risk mitigation (0.658), risk evaluation and risk mitigation (0.628), and risk assessment and risk mitigation (0.521). These values suggest that the risk management practices are related but not excessively correlated, indicating no serious multicollinearity problem.

Table 4

Correlation Matrix

Variables	CC	CE	RA	RE	RI	RM	RT
CC	1	0.16	0.23	0.27	0.19	0.28	0.328
CE	0.16	1	0.16	0.165	0.189	0.14	0.148
RA	0.23	0.16	1	0.508	0.505	0.486	0.521
RE	0.27	0.165	0.508	1	0.322	0.548	0.628
RI	0.19	0.189	0.505	0.322	1	0.391	0.441
RM	0.28	0.14	0.486	0.548	0.391	1	0.658
RT	0.328	0.148	0.521	0.628	0.441	0.658	1

Note: CC-communication and consultation, CC-Cost Effectiveness, RA-Risk assessment, RE-Risk Evaluation, RI-Risk identification, RM-Risk monitoring and RT-Risk mitigation
Sources: Author's Computation using SmartPLS 4

4.2 Hypotheses testing

4.2.1 Construct reliability and validity

Table 5 presents the construct reliability and validity results for the study variables. The Cronbach's alpha values range from 0.644 to 0.860, indicating that most constructs demonstrate acceptable internal consistency, particularly risk monitoring (0.802), risk mitigation (0.789), risk evaluation (0.752), risk assessment (0.773), and cost-effectiveness (0.860). Communication and consultation (0.644) and risk identification (0.664) are slightly below the conventional 0.70 threshold but may still be considered acceptable in exploratory studies. The composite reliability values, particularly rho_c, range from 0.727 to 0.898, exceeding the recommended minimum of 0.70, which confirms adequate reliability across the constructs. However, the Average Variance Extracted (AVE) values show mixed evidence of convergent validity. Risk mitigation (0.539), risk assessment (0.512), and cost-effectiveness (0.640) meet the recommended 0.50 benchmark, while communication and consultation (0.354), risk monitoring (0.414), risk identification (0.420), and risk evaluation (0.484) fall below the threshold. This

suggests that although the constructs generally show acceptable reliability, some indicators may require further refinement to improve convergent validity.

Table 5

Construct reliability and validity

Variables	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Communication & Consultation	0.644	0.552	0.727	0.354
Risk monitoring	0.802	0.556	0.758	0.414
Risk identification	0.664	0.727	0.768	0.42
Risk mitigation	0.789	0.798	0.854	0.539
Risk Evaluation	0.752	0.801	0.822	0.484
Risk assessment	0.773	0.809	0.839	0.512
Cost Effectiveness	0.86	0.884	0.898	0.64

Sources: Author's Computation using SmartPLS 4

4.2.2 Risk management and cost effectiveness

Table 6 and Figure 2 present the effect of risk management practices on cost-effectiveness among Mobile Network Operators in Nigeria. The result shows that communication and consultation has a positive and statistically significant effect on cost-effectiveness, with a coefficient of 0.112, t-statistic of 2.049, and p-value of 0.041. Since the p-value is less than 0.05 and the confidence interval does not include zero, this implies that effective communication and consultation improve cost-effectiveness by enhancing information sharing, stakeholder involvement, and coordinated risk response. Risk identification also has a positive and statistically significant effect on cost-effectiveness, with a coefficient of 0.138, t-statistic of 2.584, and p-value of 0.010. This suggests that the ability of MNOs to identify operational, financial, regulatory, cybersecurity, and market-related risks contributes significantly to cost savings, better resource allocation, and improved operational efficiency.

However, the results show that risk assessment, risk evaluation, risk monitoring, and risk mitigation do not have statistically significant effects on cost-effectiveness. Risk assessment has a positive but insignificant coefficient of 0.025, with a p-value of 0.686, while risk evaluation also has a positive but insignificant coefficient of 0.084, with a p-value of 0.184. Similarly, risk monitoring has a weak positive and insignificant effect,

with a coefficient of 0.018 and p-value of 0.888. Risk mitigation shows a negative but insignificant coefficient of -0.025, with a p-value of 0.760. These findings imply that although these risk management practices may be present among MNOs, they do not independently produce a significant improvement in cost-effectiveness within the sample. Overall, the results suggest that cost-effectiveness in Nigerian MNOs is significantly driven by communication and consultation and risk identification, while other risk management dimensions may require stronger implementation, better integration, or improved monitoring mechanisms to produce measurable cost benefits.

Figure 2

Structural Model Path Coefficient for Risk Management and Cost Effectiveness

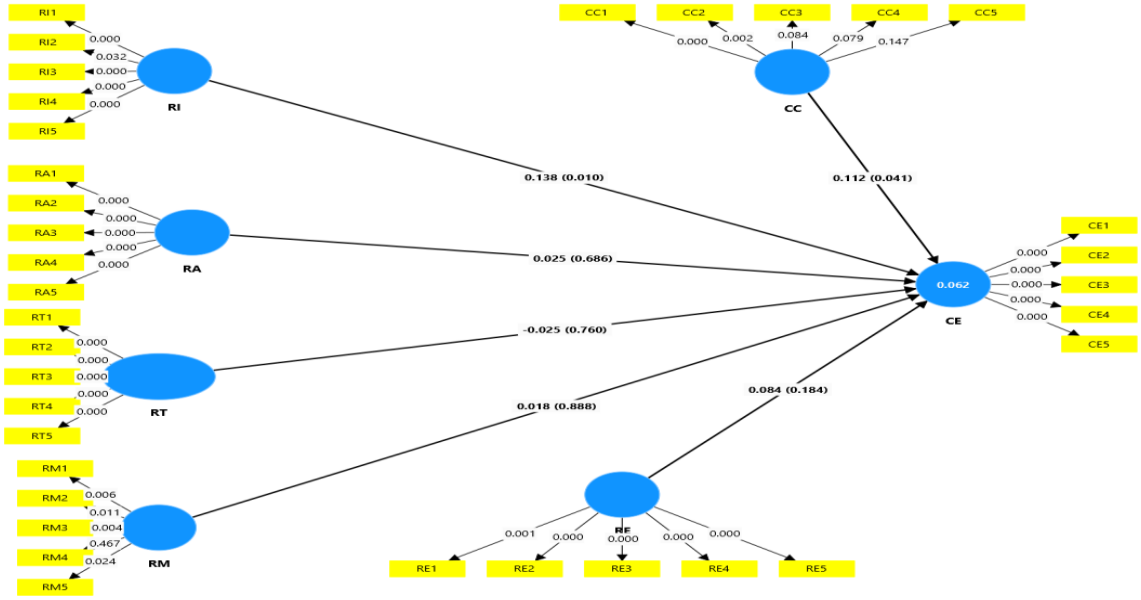


Table 6

Risk Management Practices and Cost Effectiveness

Variables	Original sample	Sample mean	Confidence intervals		Standard deviation	T statistics	P values
			2.5%	97.5%			
CC -> CE	0.112	0.127	0.025	0.224	0.055	2.049	0.041
RA -> CE	0.025	0.034	-0.087	0.156	0.063	0.405	0.686
RE -> CE	0.084	0.087	-0.039	0.209	0.063	1.327	0.184
RI -> CE	0.138	0.142	0.041	0.246	0.053	2.584	0.010
RM -> CE	0.018	-0.003	-0.276	0.205	0.128	0.141	0.888
RT -> CE	-0.025	0.008	-0.146	0.179	0.082	0.305	0.760

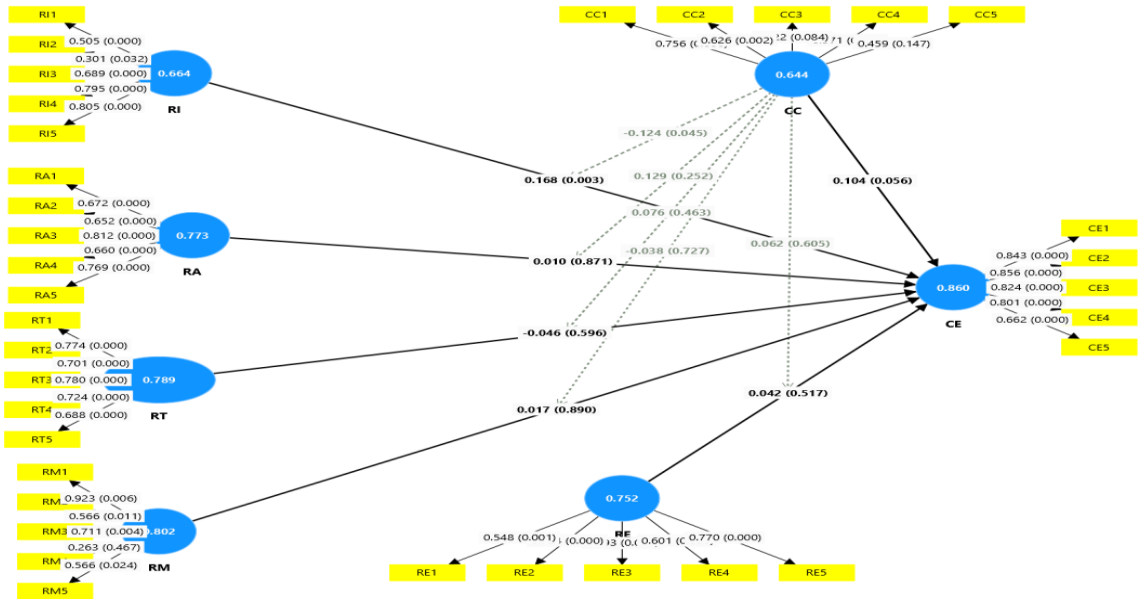
Note: CC-communication and consultation, CC-Cost Effectiveness, RA-Risk assessment, RE-Risk Evaluation, RI-Risk identification, RM-Risk monitoring and RT-Risk mitigation
Sources: Author's Computation using SmartPLS 4

4.2.3 Communication and consultation as a moderation of risk management

Table 7 and Figure 3 present the moderating effect of communication and consultation on the relationship between risk management practices and cost-effectiveness. The direct effect results show that risk identification has a positive and statistically significant effect on cost-effectiveness, with a coefficient of 0.168, t-statistic of 3.017, and p-value of 0.003. This implies that identifying risks early remains a major determinant of cost-effectiveness among Mobile Network Operators in Nigeria. Communication and consultation has a positive but marginally insignificant effect on cost-effectiveness, with a coefficient of 0.104 and p-value of 0.056, suggesting that although communication and consultation may improve cost-effectiveness, its direct effect is not statistically significant at the 5% level. Other risk management practices, including risk assessment, risk evaluation, risk monitoring, and risk mitigation, have insignificant direct effects on cost-effectiveness, as their p-values are above 0.05. This indicates that these practices do not independently explain significant changes in cost-effectiveness in the moderated model.

Figure 3

Structural Model Path Coefficient with Communication and Consultation as a Moderator



The interaction results show that communication and consultation significantly moderates the relationship between risk identification and cost-effectiveness, as the interaction term CC x RI has a coefficient of -0.124, t-statistic of 2.003, and p-value of 0.045. Since the coefficient is negative, the result suggests that communication and consultation weakens the positive effect of risk identification on cost-effectiveness. This may imply that excessive consultation, poor-quality communication, bureaucratic delays, or unclear reporting channels may reduce the cost benefits of identifying risks early. However, the moderating effects of communication and consultation on risk mitigation, risk monitoring, risk assessment, and risk evaluation are not statistically significant, as their p-values are 0.463, 0.727, 0.252, and 0.605, respectively. Therefore, communication and consultation only plays a significant moderating role in the relationship between risk identification and cost-effectiveness, while no significant moderating effect is found for the other risk management practices.

Table 7

Risk Management Practices and Cost Effectiveness Moderate by Communication and Consultation

Variables	Original sample	Sample mean	Confidence intervals		Standard deviation	T statistics	P values
			2.5%	97.5%			
CC -> CE	0.104	0.124	0.017	0.224	0.055	1.908	0.056
RA -> CE	0.010	0.018	-0.105	0.141	0.064	0.162	0.871
RE -> CE	0.042	0.043	-0.086	0.167	0.065	0.649	0.517
RI -> CE	0.168	0.168	0.062	0.277	0.056	3.017	0.003
RM -> CE	0.017	0.003	-0.272	0.202	0.124	0.139	0.890
RT -> CE	-0.046	0.000	-0.161	0.172	0.086	0.530	0.596
CC x RI -> CE	-0.124	-0.114	-0.235	0.010	0.062	2.003	0.045
CC x RT -> CE	0.076	0.043	-0.152	0.247	0.104	0.735	0.463
CC x RM -> CE	-0.038	0.006	-0.195	0.221	0.110	0.349	0.727
CC x RA -> CE	0.129	0.103	-0.129	0.307	0.112	1.145	0.252
CC x RE -> CE	0.062	0.066	-0.148	0.295	0.120	0.517	0.605

Note: CC-communication and consultation, CC-Cost Effectiveness, RA-Risk assessment, RE-Risk Evaluation, RI-Risk identification, RM-Risk monitoring and RT-Risk mitigation
Sources: Author's Computation using SmartPLS 4

4.2.4 Stability tests

Table 8 presents the stability and model fit tests for the estimated SmartPLS model. The SRMR value for both the saturated and estimated models is 0.099, which is close to the acceptable threshold of 0.08 to 0.10, indicating a moderate model fit. The

d_ULS and d_G values are 6.234 and 1.043 for the saturated model, and 6.236 and 1.043 for the estimated model, showing that the difference between the observed and implied correlation matrices is relatively stable across both models. The NFI values of 0.592 and 0.591 are below the commonly recommended threshold of 0.90, suggesting that the model fit is weak and may require further refinement. Panel 2 shows that the VIF values range from 1.163 to 2.890, which are below the threshold of 5, indicating that multicollinearity is not a serious concern among the predictors. The R-square value of 0.456 implies that risk management practices and communication and consultation jointly explain 45.6% of the variation in cost-effectiveness, while the remaining 54.4% is explained by other factors not captured in the model.

Table 8

Stability Tests

	SRMR	d_ULS	d_G	Chi-square	NFI
Saturated model	0.099	6.234	1.043	2659.189	0.592
Estimated model	0.099	6.236	1.043	2660.462	0.591
Panel 2 VIF and R-Square					
Variables	VIF	Variables	VIF	Variables	VIF
CC -> CE	1.163	RM -> CE	1.88	CC x RT -> CE	2.89
RA -> CE	1.754	RT -> CE	2.314	CC x RM -> CE	2.127
RE -> CE	1.919	CC x RI -> CE	1.334	CC x RE -> CE	2.583
RI -> CE	1.501	CC x RA -> CE	2.679	R-Square	0.456

Sources: Author's Computation using SmartPLS 4

4.3 Discussion of findings

The findings of the study are consistent with the position that communication and consultation are central to effective risk management and cost-related performance. The significance of communication and consultation supports Gharaibeh (2019), who reported that one of the major benefits of risk management is improved communication among project stakeholders, which enhances coordination and reduces delays and cost overruns. It also agrees with Mwangi and Ngugi (2018), who emphasized stakeholder involvement in project planning and formulation as necessary for effective risk mitigation. In the context of Nigerian Mobile Network Operators, this suggests that communication and consultation help departments such as operations, finance, internal audit, legal, regulatory

affairs, cybersecurity, and network management to share risk-related information and coordinate responses that can improve cost-effectiveness. The finding also aligns with Soi, Mzenzi, and Suluo (2026), who found that meetings with substantive risk agendas improved risk management effectiveness, and Darsono *et al*. (2025), who showed that credible communication and assurance of risk-related information strengthen stakeholder confidence. Similarly, the significant effect of risk identification supports Mustapha *et al*. (2023), who found that risk management practices improve organizational performance in Nigeria, and Oreshile, Zainudin, and Mahdzan (2026), who established that high-quality enterprise risk management reduces financial distress among African firms. This implies that early detection of operational, regulatory, cybersecurity, market, and infrastructure risks is particularly important for reducing avoidable costs and improving operational efficiency among MNOs.

However, the non-significant effects of risk assessment, risk evaluation, risk monitoring, and risk mitigation suggest that the existence of formal risk management activities does not automatically translate into cost-effectiveness. This finding differs from Egiyi and Eze (2022), who reported that risk analysis, evaluation, risk threat assessment, and monitoring significantly improved organizational efficiency. It also contrasts with Gharaibeh (2019), who found that risk management helps reduce delays and cost overruns through proper mitigation planning. Nevertheless, the result is partly consistent with Mwangi and Ngugi (2018), whose study showed mixed effects of risk management practices on project performance, with some practices producing positive outcomes and others showing inverse relationships. The finding also relates to Aloulou and Alshohail (2026), who observed that risk management did not significantly mediate the relationship between governance, compliance, operational efficiency, and reputation in technology-driven firms. This suggests that among Nigerian MNOs, risk assessment, evaluation, monitoring, and mitigation may not yet be sufficiently integrated into cost-control decisions, or they may be implemented in a manner that is more compliance-oriented than performance-oriented. Therefore, for these practices to improve cost-effectiveness, they must be linked to timely decision-making, accountability, implementation capacity, and measurable cost-saving outcomes.

The moderating role of communication and consultation provides a more nuanced contribution to the literature. Although prior studies generally present communication and

consultation as supportive elements of risk management, the finding that communication and consultation weakened the relationship between risk identification and cost-effectiveness suggests that the quality, speed, and structure of communication matter. This contrasts with Gharaibeh (2019), Mwangi and Ngugi (2018), and Soi *et al*. (2026), who emphasized communication, stakeholder involvement, and risk meetings as positive drivers of risk management effectiveness. In the Nigerian telecommunication context, the negative moderation may indicate that excessive consultation, bureaucratic procedures, unclear reporting lines, delayed escalation, or poor-quality communication can reduce the cost benefits of early risk identification. The finding therefore supports the broader view of Horvey and Odei-Mensah (2025), Al-Hajaya (2026), and Toumeh and Ghazalat (2026) that risk management effectiveness depends not only on the presence of formal structures but also on governance quality, oversight effectiveness, and the ability to translate risk information into timely strategic action. Overall, the study extends the empirical literature by showing that cost-effectiveness among Nigerian MNOs is influenced more strongly by early risk identification and effective communication processes than by the mere existence of risk assessment, evaluation, monitoring, and mitigation activities.

5 CONCLUSION

The study concludes that risk management practices play an important role in explaining cost-effectiveness among Mobile Network Operators in Nigeria, although their effects differ across dimensions. The findings show that communication and consultation, as well as risk identification, are the most influential factors in improving cost-effectiveness. This implies that MNOs are more likely to achieve cost savings, reduce avoidable losses, and improve operational efficiency when risks are identified early and risk-related information is effectively shared among relevant stakeholders. However, risk assessment, risk evaluation, risk monitoring, and risk mitigation did not significantly influence cost-effectiveness, suggesting that these practices may not yet be sufficiently integrated into strategic and operational cost-control decisions. The moderation result further indicates that communication and consultation can weaken the effect of risk identification when communication processes are excessive, delayed, or poorly coordinated.

Based on the findings, the study recommends that Mobile Network Operators in Nigeria should strengthen their risk identification systems by adopting proactive mechanisms for detecting operational, financial, regulatory, cybersecurity, market, and infrastructure-related risks before they escalate into major cost burdens. MNOs should also improve the quality of communication and consultation by ensuring that risk-related information is timely, clear, action-oriented, and shared with relevant departments without unnecessary bureaucracy. Furthermore, management should integrate risk assessment, risk evaluation, monitoring, and mitigation more directly into cost-control and performance management systems so that these practices produce measurable cost benefits. The study also recommends regular staff training, interdepartmental risk meetings, improved reporting channels, and stronger accountability mechanisms to ensure that identified risks are translated into practical mitigation actions that enhance cost-effectiveness and long-term performance.

REFERENCES

Al-Hajaya, K. (2026). ESG performance and corporate corruption risk management: The moderating role of risk management committees in GCC firms. *Journal of Risk and Financial Management*, 19(1), 38. https://doi.org/10.3390/jrfm19010038

Aloulou, W. J., & Alshohail, N. F. (2026). From control to value: How governance, risk management and compliance improve operational efficiency and company reputation in Saudi technology-driven firms. *Risks*, 14(1), 19. https://doi.org/10.3390/risks14010019

Baltas, K. N., & Liñares-Zegarra, J. M. (2025). Efficiency and financial risk management practices of microfinance institutions. *International Journal of Finance & Economics*, 30(2), 1011–1031. https://doi.org/10.1002/ijfe.2956

Byrne, B. M. (2016). Structural equation modeling with AMOS: Basic concepts, applications, and programming (3rd ed.). Routledge.

Committee of Sponsoring Organizations of the Treadway Commission. (2004). *Enterprise risk management—Integrated framework.* COSO.

Committee of Sponsoring Organizations of the Treadway Commission. (2017). *Enterprise risk management—Integrating with strategy and performance.* COSO.

Darsono, D., Ratmono, D., Tujori, A., & Clarisa, T. Y. (2025). The relationship between ESG, financial performance, and cost of debt: The role of independent assurance. *Cogent Business & Management*, 12(1). https://doi.org/10.1080/23311975.2024.2437137

Egiyi, M. A., & Eze, R. C. (2022). The influence of risk management on organizational efficiency. *Annals of Management Sciences,* 9(1), 10–15.

Gharaibeh, H. M. (2019). Challenges and benefits of applying risk management to construction projects in Jordan. *International Journal of Civil Engineering, Construction and Estate Management*, 7(3), 22–36.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis (8th ed.).* Cengage Learning.

Horvey, S. S., & Odei-Mensah, J. (2025). Enterprise risk management, corporate governance and insurers risk-taking behaviour in South Africa: Evidence from a linear and threshold analysis. *Journal of Accounting in Emerging Economies*, 15(1), 53–83. https://doi.org/10.1108/JAEE-08-2023-0242

Jöreskog, K. G. (1970). A general method for analysis of covariance structures. *Biometrika*, 57(2), 239–251. https://doi.org/10.1093/biomet/57.2.239

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Kouloukoui, D., da Silva Gomes, S. M., Torres, F. A., & others. (2025). Business climate risk management: International perspectives and strategic determinants. *Environment, Development and Sustainability*, 27, 4683–4724. https://doi.org/10.1007/s10668-023-04094-z

Mustapha, B., Olaleye, B. R., Yetunde, O. B., Olanike, O. O., Akindele, G., Abdurrashid, I., Adedokun, J. O., Bamidele, J. A., & Owoniya, B. O. (2023). Risk management practice and organizational performance: The mediating role of business model innovation. *Journal of Law and Sustainable Development,* 11(4), e892. https://doi.org/10.55908/sdgs.v11i4.892

Mwangi, H. M., & Ngugi, L. (2018). Risk management practices and performance of construction projects in Nairobi City County Government, Kenya. *International Academic Journal of Information Sciences and Project Management*, 3(2), 111–136. http://www.iajournals.org/articles/iajispm_v3_i2_111_136.pdf

Nguyen, M. V. (2026). Exploring the impacts of risk perception and risk management planning on innovation orientation: A PLS-SEM approach. *Engineering, Construction and Architectural Management,* 33(1), 509–531. https://doi.org/10.1108/ECAM-01-2024-0137

Nguyen, N. M., Abu Afifa, M. M., Thi Truc Dao, V., Van Bui, D., & Vo Van, H. (2026). The influence of business intelligence and sustainable risk management on sustainability performance: Moderated mediating model by information technology governance. *International Journal of Organizational Analysis,* 34(4), 1300–1329. https://doi.org/10.1108/IJOA-05-2024-4494

Oko-Odion, C., & Angela, O. (2025). Risk management frameworks for financial institutions in a rapidly changing economic landscape. *International Journal of Science and Research Archive*, 14(1), 1182–1204. https://doi.org/10.30574/ijsra.2025.14.1.0155

Oreshile, S. A., Zainudin, R., & Mahdzan, N. S. (2026). Enterprise risk management quality and financial distress in African firms: Insights from firm heterogeneity. *Journal of Accounting in Emerging Economies,* 16(2), 233–261. https://doi.org/10.1108/JAEE-03-2025-0118

Shah, S. Q. A., Lai, F., Shad, M. K., Hamad, S., & Ellili, N. O. D. (2025). Exploring the effect of enterprise risk management for ESG risks towards green growth. *International Journal of Productivity and Performance Management,* 74(1), 224–249. https://doi.org/10.1108/IJPPM-10-2023-0582

Shi, X., Zhang, Y., Yu, M., & Zhang, L. (2025). Deep learning for enhanced risk management: A novel approach to analyzing financial reports. *PeerJ Computer Science*, 11, e2661. https://doi.org/10.7717/peerj-cs.2661

Soi, G. J., Mzenzi, S. I., & Suluo, S. (2026). Assessing the influence of audit committee characteristics on the effectiveness of risk management practices in public statutory corporations in Tanzania. *Business Management Review,* 28(2), Article 5. https://doi.org/10.56279/bmrj.v28i1.8610

Toumeh, A. A., & Ghazalat, A. (2026). Mandatory governance and risk management committees and firm performance: Evidence from Jordan's non-financial sector. *Cogent Business & Management,* 13(1). https://doi.org/10.1080/23311975.2026.2618306

Wright, S. (1921). Correlation and causation. *Journal of Agricultural Research*, 20(7), 557–585.

Yahaya, O. A. (2026). How could earnings quality profit from risk management committee presence? *Journal of Business, Economics and Management*, 19(1), 615–638. https://journal.skillsoftpublishers.com/index.php/jbem/index

Yahaya, O. A. (2026). The impact of credit risk management on the financial performance and valuation of banks in Nigeria. *International Journal of Accounting,* 22(2), 110–138. https://10.10181/ija.2026.v22i2.110

Yue, Y. (2025). Time-series nested reinforcement learning for dynamic risk control in nonlinear financial markets. *Transactions on Computational and Scientific Methods*, 5(1). https://doi.org/10.5281/zenodo.14677117

Zhang, L. S. (2025). The impact of ESG performance on the financial performance of companies: Evidence from China's Shanghai and Shenzhen A-share listed companies. *Frontiers in Environmental Science*, 13, 1507151. https://doi.org/10.3389/fenvs.2025.1507151