

Risk Assessment and Operational Efficiency of Companies in the Road Construction Industry in Kenya

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ABSTRACT

Operational efficiency is important to road construction companies because it reflects firms' capacity to use resources economically, complete projects promptly, deliver services effectively and meet client quality requirements. This study examined the relationship between risk assessment and operational efficiency of companies in the road construction industry in Kenya. The study adopted a descriptive research design. The target population comprised 16,684 road works contractors licensed by the National Construction Authority as of 1 July 2025. A sample of 391 was determined, and 288 usable responses were obtained, representing a 74% response rate. Risk assessment was measured using four items covering risk identification, risk sensitization, risk evaluation and risk response. The risk-assessment scale recorded Cronbach's alpha of .752, KMO of .597 and a significant Bartlett's test ($\chi^2 = 475.246$, $df = 6$, $p < .001$). Operational efficiency was measured perceptually using four questionnaire items assessing respondents' views on the contribution of internal controls to cost effectiveness, prompt project completion, service delivery and meeting client quality demands. The operational-efficiency scale recorded Cronbach's alpha of .856. Pearson correlation analysis showed a positive and statistically significant relationship between risk assessment and operational efficiency ($r = .433$, $p < .001$, $N = 288$). Simple linear regression analysis further established that risk assessment significantly predicted operational efficiency, $F(1, 286) = 66.01$, $p < .001$, accounting for approximately 18.7% of the variation in operational efficiency ($R^2 = .187$). The standardized regression coefficient was positive ($\beta = .433$). The null hypothesis that risk assessment has no statistically significant relationship with operational efficiency was therefore rejected. The study concludes that stronger risk-assessment practices are associated with higher perceived operational efficiency among road construction companies in Kenya. It recommends strengthening systematic risk identification, risk sensitization, risk evaluation and timely response to risk mitigation measures to support operational efficiency.

Keywords: Risk assessment, operational efficiency, internal controls, road construction industry, Kenya

INTRODUCTION

Operational efficiency emanates from the broader concept of operational performance and reflects the extent to which an organization utilizes available resources to achieve desired outcomes while controlling costs and minimizing operational inefficiencies. Mberia et al. (2025) demonstrate the importance of effective risk management practices in enhancing performance within construction firms, while Machira and Kising'u (2024) associate effective risk management with improved performance of road construction projects in Kenya. In road construction, operational efficiency is particularly important because firms must balance cost, project completion, service delivery and quality while operating in an environment exposed to financial, operational, regulatory, technological and political risks.

Risk assessment involves the systematic identification and analysis of relevant risks that may impair the achievement of organizational objectives and provides a basis for determining appropriate responses. It entails identifying potential risks, evaluating their likelihood and impact, determining the level of exposure and implementing appropriate mitigation measures. Obayagbona and Osagiende (2023) demonstrate that different dimensions of risk may have varying effects on organizational performance, underscoring the importance of

systematically assessing individual risk exposures. In the present study, risk assessment was operationalized through four dimensions: systematic risk identification, risk sensitization, risk evaluation and response to risk mitigation measures. Effective risk assessment further requires relevant risk information to be communicated in a timely manner to support appropriate managerial and operational responses.

Road construction companies operate in an environment where project delays, cost pressures, cash-flow constraints, political interference, changing regulations, competition and technological developments can affect the achievement of operational objectives. Machira and Kising'u (2024) established that risk identification and risk analysis were positively associated with the performance of road construction projects in Kenya. Similarly, Mberia et al. (2025) reported a positive relationship between risk evaluation practices and the performance of construction firms in Kenya. Risk assessment therefore provides management with a structured basis for identifying potential threats, evaluating their implications and implementing appropriate responses before the risks materially impair operations. Against this background, the present study focused specifically on the effect of risk assessment on operational efficiency among companies in the road construction industry in Kenya.

Statement of the Problem

Operational efficiency in the road construction industry is important for improving productivity, optimizing resource utilization and reducing the cost of routine operations. Despite reforms intended to improve performance in Kenya's road construction sector, operational inefficiencies remain a challenge. Delays in project completion and poor efficiency have affected time and cost efficiency in the road construction industry, while insufficient implementation capacity, cash-flow management challenges and ineffective internal controls have been identified among the causes of project failures. Inadequate internal controls may further expose organizations to loss of assets, unreliable reporting, inefficient operations and failure to achieve organizational goals.

Existing empirical evidence on risk assessment and organizational performance remains varied and has been generated across different organizational and project contexts. Adeyemo and Adebayo (2021) reported no significant effect of risk assessment practices on performance among listed non-financial firms in Nigeria. In contrast, Machira and Kising'u (2024) established that risk identification and risk analysis had positive and statistically significant relationships with the performance of road construction projects in Kilifi County, Kenya. Obayagbona and Osagiende (2023) similarly demonstrated that different dimensions of risk produced different performance effects in the Nigerian banking industry. More recently, Mberia et al. (2025) found a positive relationship between risk evaluation practices and the performance of construction firms in Nairobi County, Kenya. However, these studies focused on firm performance, project performance or banking performance rather than specifically examining operational efficiency among road construction companies across Kenya. This contextual and conceptual gap provided the basis for the present study, which examined whether risk assessment significantly affects operational efficiency among companies in the road construction industry in Kenya.

Objective of the Study

To examine the relationship between risk assessment and operational efficiency of companies in the road construction industry in Kenya.

Research Hypothesis

H₀₁: Risk assessment has no statistically significant relationship with operational efficiency of companies in the road construction industry in Kenya.

LITERATURE REVIEW

Theoretical Review – Agency Theory

Agency Theory was developed by Jensen and Meckling (1976) to explain the relationship between principals,

such as shareholders, and agents, such as managers entrusted with running the firm. The theory highlights potential conflicts of interest between principals and agents and the implications of such conflicts for risk-taking behaviour and decision making. Because managers make decisions using resources entrusted to them by owners, monitoring and control mechanisms are required to reduce agency problems and align managerial actions with organizational objectives.

Agency Theory is relevant to risk assessment because risk identification, sensitization, evaluation and response provide mechanisms through which managers can recognize exposures that threaten organizational objectives and make decisions that protect organizational resources. In the road construction industry, activities involve multiple operational stages, substantial resource commitments and exposure to changing internal and external conditions. Systematic risk assessment can therefore strengthen accountability and reduce the likelihood that unmanaged risks undermine operational efficiency.

Conceptual Framework

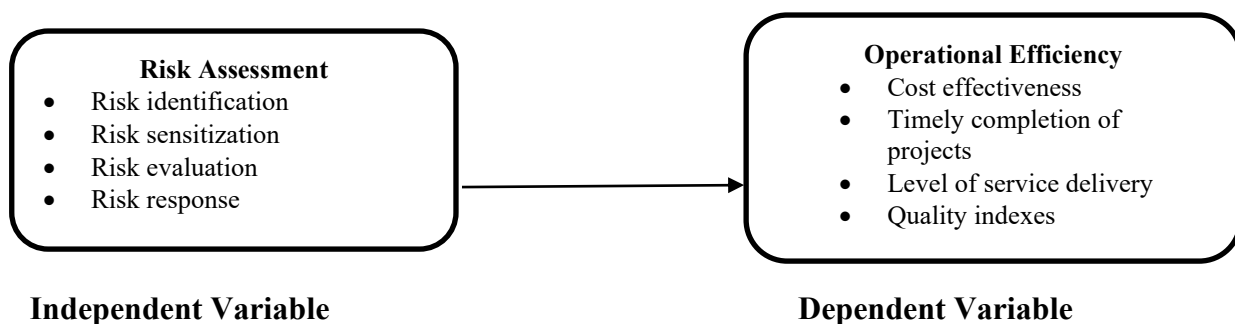


Figure 1: Conceptual Framework

Risk Assessment

Risk assessment refers to the process through which an organization identifies, analyses and determines appropriate responses to exposures that may adversely affect the achievement of its objectives. Obayagbona and Osagiende (2023) demonstrate the importance of examining different dimensions of risk because individual risk exposures may have different implications for organizational performance. Risk assessment therefore enables organizations to identify potential risks, evaluate their likelihood and consequences, and determine suitable responses. In this study, risk assessment was operationalized in terms of risk identification, risk sensitization, risk evaluation and risk response.

Operational Efficiency

Operational efficiency refers to an organization's ability to utilize available resources effectively while minimizing waste, costs and operational inefficiencies in the delivery of its outputs. Gerami and Gerami (2025) associate operational efficiency in construction businesses with the effective management and utilization of organizational resources and processes to improve operational outcomes. In this study, operational efficiency was operationalized in terms of cost effectiveness, timely completion of projects, level of service delivery and quality indexes.

Empirical Review

Adeyemo and Adebayo (2021) examined risk assessment practices and firm performance among 44 non-financial listed companies in Nigeria using secondary data for 2010–2019. Their findings indicated that risk assessment practices had no significant effect on performance, although selected governance variables significantly influenced some performance measures. The study was conducted outside the road construction industry, creating a contextual gap. Obayagbona and Osagiende (2023) examined risk assessment and performance in the Nigerian banking industry using panel data and fixed-effects estimation. Credit and operational risk variables had negative and statistically insignificant relationships with performance, while liquidity and market risks had significant positive effects and interest-rate risk had a significant negative

relationship. The use of several risk dimensions in banking creates both contextual and conceptual differences from the present study.

Oluwaleye et al. (2023) investigated risk assessment and profitability of quoted banks in Nigeria using correlation analysis and panel estimators for 2007–2020. Their findings showed differing effects across liquidity, capital, market, operational and credit risk measures. Rasheed et al. (2018), studying conventional and Islamic banks in Pakistan, found that awareness of operational risk had an important role in operational risk management. Collectively, the reviewed studies show varied results and predominantly focus on banking or listed firms rather than road construction companies in Kenya.

METHODOLOGY

The study adopted a descriptive research design. The target population comprised 16,684 road construction contractors in Kenya licensed by the National Construction Authority as of 1st July 2025. The contractors were distributed across the eight NCA road works categories, namely NCA1, NCA2, NCA3, NCA4, NCA5, NCA6, NCA7 and NCA8. The sample size was determined using Yamane’s (1967) formula at a 5% level of precision, resulting in a sample of 391 road works companies. Proportionate stratified sampling was used to distribute the sample across the eight NCA road works categories. The resulting sample comprised 8 NCA1, 7 NCA2, 11 NCA3, 37 NCA4, 47 NCA5, 85 NCA6, 80 NCA7 and 116 NCA8 road works contractors. Simple random sampling was subsequently used to identify a respondent from each of the 391 selected companies.

Primary data were collected using a structured questionnaire containing closed-ended questions. A pilot study involving 40 respondents drawn from the eight NCA road works categories was conducted to assess the validity and reliability of the research instrument. Construct validity was assessed using the Kaiser-Meyer-Olkin measure and Bartlett’s test of sphericity under factor analysis. Reliability was assessed using Cronbach’s alpha coefficient, with a threshold of 0.70 adopted as the acceptable level of internal consistency. Following the required research approvals and authorization, questionnaires were administered to the respondents using Google Forms. The collected data were edited, coded and checked for completeness and accuracy before analysis. Descriptive statistics included means, frequencies, standard deviations, variances and percentages, while inferential analysis involved Pearson product-moment correlation and regression analysis.

For this study, Pearson product-moment correlation was used to determine the relationship between risk assessment and operational efficiency, while simple linear regression was used to determine the effect of risk assessment on operational efficiency. The regression model was specified as: $Y = \beta_0 + \beta_1 X_1 + \varepsilon$, where: Y = Operational efficiency, β_0 = Constant, β_1 = Regression coefficient for risk assessment, X_1 = Risk assessment and ε = Error term

FINDINGS AND DISCUSSION

Response Rate

The study targeted 391 respondents from companies in the road construction industry in Kenya. A total of 288 questionnaires were successfully completed and collected, giving a response rate of 74%.

Table 1: Response Rate

Category	Administered	Collected	Percentage
Road Works	391	288	74%
Total	391	288	74%

Reliability and Validity of Tests

Risk assessment recorded a Cronbach’s alpha coefficient of .752 across four items, while operational efficiency recorded a Cronbach’s alpha coefficient of .856 across four items. Both coefficients exceeded the .70 threshold adopted in the study, indicating acceptable internal consistency of the measurement scales.

Table 2: Reliability of Study Variables

Variable	Cronbach's Alpha	Test Items
Risk Assessment	0.752	4
Operational Efficiency	0.856	4

Construct validity was assessed using factor analysis. Risk assessment produced a KMO value of .597, above the minimum criterion of .500. Bartlett's test of sphericity was statistically significant, $\chi^2 = 475.246$, $df = 6$, $p < .001$. Principal component analysis further showed that all four risk-assessment items had extraction communalities above .500 and were retained.

Table 3: KMO and Bartlett's Test for Risk Assessment

Test	Statistic	Value
Kaiser-Meyer-Olkin measure	KMO	0.597
Bartlett's Test of Sphericity	Approx. Chi-Square	475.246
Bartlett's Test of Sphericity	df	6
Bartlett's Test of Sphericity	Sig.	0

Table 4: Commuality Extracts for Risk Assessment

Risk Assessment Item	Initial	Extraction
The company conducts risk identification systematically	1	0.923
The company adopts risk sensitization appropriately	1	0.715
The company does risk evaluation satisfactorily	1	0.746
The company responds to risk mitigation measures swiftly	1	0.923

Extraction Method: Principal Component Analysis.

Descriptive Statistics for Risk Assessment

Respondents were generally neutral regarding the risk-assessment practices examined. Systematic risk identification recorded a mean of 3.1944, risk sensitization 3.0417, risk evaluation 2.9236 and swift response to risk mitigation measures 3.1319. The pattern indicates that risk-assessment practices were present but were not strongly affirmed by respondents.

Table 5: Descriptive Statistics for Risk Assessment

Risk Assessment Statement	N	Min	Max	Mean	Std. Dev.
The company conducts risk identification systematically	288	1	5	3.1944	1.35779
The company adopts risk sensitization appropriately	288	1	5	3.0417	1.22047
The company does risk evaluation satisfactorily	288	1	5	2.9236	1.22733
The company responds to risk mitigation measures swiftly	288	1	5	3.1319	1.38557

Descriptive Statistics for Operational Efficiency

Respondents generally agreed with the four perception-based operational-efficiency statements. The mean scores ranged from 4.1007 for perceived contribution to service delivery to 4.1424 for perceived contribution to meeting client quality demands. These results should be interpreted as respondents' assessments of operational-efficiency outcomes rather than direct measurements of costs, completion time, service-output ratios or quality indices.

Table 6: Descriptive Statistics for Operational Efficiency

Operational Efficiency Statement	N	Min	Max	Mean	Std. Dev.
Internal controls have contributed to the cost effectiveness of the company	288	1	5	4.1111	0.75695
Internal controls have contributed to the prompt completeness of the projects of the company	288	1	5	4.1042	0.78504
Internal controls have contributed to high level of service delivery of the company	288	1	5	4.1007	0.78327
Internal controls have contributed to meeting quality demands of clients in the company	288	1	5	4.1424	0.77226

Correlation Analysis

Pearson correlation analysis established a positive and statistically significant relationship between risk assessment and operational efficiency ($r = .433$, $p < .001$, $N = 288$). The coefficient indicates a moderate positive association: higher reported risk-assessment practices tended to occur alongside higher perceived operational-efficiency outcomes. The correlation does not establish a causal effect.

Table 7: Risk Assessment Correlation Analysis

Variable	Statistic	Operational Efficiency
Risk Assessment	Pearson Correlation	.433**
	Sig. (2-tailed)	0
	N	288

** Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis and Hypothesis Testing

Simple linear regression analysis was used to determine the effect of risk assessment on operational efficiency of companies in the road construction industry in Kenya. The model produced a correlation coefficient of $R = .433$ and a coefficient of determination of $R^2 = .187$. This indicates that risk assessment accounted for approximately 18.7% of the variation in operational efficiency, while the remaining variation was attributable to factors not included in the simple regression model.

Table 8: Model Summary for Risk Assessment and Operational Efficiency

R	R Square	Adjusted R Square
0.433	0.187	0.185

Predictor: Risk Assessment

Dependent Variable: Operational Efficiency

Analysis of variance showed that the simple regression model was statistically significant, $F(1, 286) = 66.01$, $p < .001$. This indicates that risk assessment significantly predicted operational efficiency.

Table 9: ANOVA for Risk Assessment and Operational Efficiency

Model	df	F	Sig.
Regression	1	66.01	<.001
Residual	286		
Total	287		

The standardized regression coefficient for risk assessment was positive ($\beta = .433$), indicating that higher levels of risk assessment were associated with higher levels of operational efficiency. The effect was statistically significant ($p < .001$). Consequently, the null hypothesis that risk assessment has no statistically significant relationship with operational efficiency of companies in the road construction industry in Kenya was rejected.

DISCUSSION OF FINDINGS

The findings established a positive and statistically significant relationship between risk assessment and operational efficiency among companies in the road construction industry in Kenya. Pearson correlation analysis showed a moderate positive association between risk assessment and operational efficiency ($r = .433$, $p < .001$). The simple linear regression model was also statistically significant, $F(1, 286) = 66.01$, $p < .001$, with risk assessment accounting for approximately 18.7% of the variation in operational efficiency ($R^2 = .187$). The standardized regression coefficient was positive ($\beta = .433$), indicating that higher levels of risk assessment were associated with higher levels of perceived operational efficiency. The null hypothesis that risk assessment has no statistically significant relationship with operational efficiency of companies in the road construction industry in Kenya was therefore rejected.

The findings suggest that systematic risk identification, risk sensitization, risk evaluation and timely response to risk mitigation measures are associated with operational-efficiency outcomes in road construction companies. Effective risk assessment enables companies to identify potential exposures, evaluate their implications and respond to emerging risks before they adversely affect operations. Within the road construction environment, where companies face financial, operational, regulatory, technological and project-related uncertainties, structured risk-assessment practices can therefore contribute to better management of operational exposures. However, the cross-sectional design does not establish that risk assessment causes changes in operational efficiency; rather, the findings demonstrate that companies reporting stronger risk-assessment practices also tended to report stronger operational-efficiency outcomes.

The finding agrees with Machira and Kising'u (2024), who established that risk identification and risk analysis had positive and statistically significant relationships with the performance of road construction projects in Kenya. It is also consistent with Mberia et al. (2025), who found a positive relationship between risk evaluation practices and the performance of construction firms in Nairobi County, Kenya. Obayagbona and Osagiende (2023) further demonstrated that different dimensions of risk have varying effects on organizational performance, emphasizing the importance of identifying and managing specific risk exposures. However, the finding differs from Adeyemo and Adebayo (2021), who reported that risk assessment practices had no significant effect on the performance of listed non-financial companies in Nigeria. The variation in findings reinforces the importance of organizational, sectoral and geographical context when examining the relationship between risk assessment and organizational outcomes.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study examined the relationship between risk assessment and operational efficiency of companies in the road construction industry in Kenya. Risk assessment was measured through risk identification, risk sensitization, risk evaluation and risk response, while operational efficiency was assessed in terms of cost effectiveness, timely completion of projects, level of service delivery and quality. Respondents were generally neutral regarding the four risk-assessment practices. Pearson correlation analysis established a positive and statistically significant relationship between risk assessment and operational efficiency ($r = .433$, $p < .001$, $N = 288$). Simple linear regression analysis further established that risk assessment significantly predicted operational efficiency, $F(1, 286) = 66.01$, $p < .001$. The model produced $R = .433$ and $R^2 = .187$, indicating that risk assessment accounted for approximately 18.7% of the variation in operational efficiency. The standardized regression coefficient was positive ($\beta = .433$). Consequently, the null hypothesis that risk

assessment has no statistically significant relationship with operational efficiency of companies in the road construction industry in Kenya was rejected.

Conclusions

The study concludes that risk assessment has a positive and statistically significant relationship with operational efficiency among companies in the road construction industry in Kenya. Companies reporting stronger practices in systematic risk identification, risk sensitization, risk evaluation and timely response to risk mitigation measures also tended to report higher levels of perceived operational efficiency. Risk assessment accounted for approximately 18.7% of the variation in operational efficiency, indicating that risk assessment is a significant predictor of operational efficiency, although a substantial proportion of variation is associated with other factors not included in the simple regression model. The findings therefore underscore the relevance of structured risk-assessment practices to operational efficiency in road construction companies. Nevertheless, because the evidence was obtained through a cross-sectional descriptive survey and operational efficiency was based on respondents' perceptions, the findings establish statistical association and predictive relationship within the estimated model rather than definitive causality.

Recommendations

Companies in the road construction industry in Kenya should strengthen systematic risk identification, risk sensitization, risk evaluation and timely response to risk mitigation measures. Management should establish procedures for continuously identifying emerging operational risks, evaluating their likelihood and potential consequences, communicating relevant risk information across operational levels and implementing appropriate mitigation measures. Particular attention should be given to strengthening risk evaluation because it recorded the lowest mean among the four risk-assessment practices examined. Companies should regularly evaluate identified risks and prioritize them according to their likelihood and potential operational consequences. Risk sensitization should similarly be strengthened to ensure that employees and relevant operational personnel understand identified risks and their responsibilities in responding to them. The National Construction Authority and other relevant sector stakeholders should encourage structured risk-assessment practices among road works contractors as part of sound internal-control systems. Such practices should emphasize systematic risk identification, awareness and sensitization, regular risk evaluation and timely implementation of appropriate risk responses to support cost effectiveness, timely project completion, service delivery and quality outcomes.

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