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RESOURCE RISK MANAGEMENT STRATEGIES AND ROAD CONSTRUCTION PROJECT DELIVERY IN KENYA

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ABSTRACT

This study sought to determine the influence of resource risk management strategies on delivery of road construction projects in Kenya, with the main focus on Nairobi Expressway, Kenol-Marua and Isebania-Ahero road projects. This study used an explanatory research design that tries to understand a problem that has not been conclusively researched. This study collected both primary and secondary data. The primary data were collected from 45 respondents in the management level using questionnaires. Quantitative data were analyzed by calculating the response rate with descriptive statistics such as means, median, standard deviation, and percentages using the statistical package for social sciences (SPSS) version 28. The analyzed data were presented by the use of graphs and frequency tables. The qualitative data was analyzed using content analysis where common themes were placed together and then subjected to descriptive statistics. The study revealed that Resource Risk Management Strategy had a positive significant effect on road construction project delivery at 95% confidence level ($\beta = 0.34, t(34) = 2.47, p = 0.019$). *This indicated a positive and statistically significant relationship between resource risk management strategy and road construction project delivery. The significant positive effect of resource risk management strategies on road construction project delivery highlights their value in managing construction risks. Road construction companies are therefore encouraged to institutionalize resource risk management practices such as early procurement, use of efficient machinery, and employee welfare policies to enhance schedule adherence and budget compliance. The current study therefore strongly recommends that policymakers for example KeNHA should develop and enforce laws and regulations governing resource risk management strategies to ensure that all road construction companies comply with established guidelines, thereby minimizing delays caused by clearance processes with relevant authorities.*

KEYWORDS: *Resource, Risk, Management Strategies, Project Delivery, Road Construction*

INTRODUCTION

Background of the Study

Road infrastructure plays a crucial contribution to the social and economic development of any country. This is particularly true in Kenya where road transport is the most widely used mode of transport. It is for this reason there has been an increase in the expansion and upgrade of the road network in Kenya to increase economic performance. Nairobi Expressway Road project, a 27-kilometer four-lane dual carriageway linking Mlolongo town in Machakos County and Jomo Kenyatta International Airport to the Nairobi-Nakuru highway is one of the completed road projects by December, 2024 that was expected to improve connectivity for the transport of goods, services, and people between Nairobi and the entire northern corridor. Another road construction project is the Isebania-Kisii-Ahero (A1) Road Rehabilitation project. It is 172 kilometers road traversing four counties; Migori, Kisii, Homa Bay, and Kisumu. The road is expected to facilitate the cross-border movement of passengers and freight, and expand the regional market size. The reason for the rehabilitation of the road was that it had deteriorated over the years due to increased transit traffic on the road. Furthermore, the road is narrow with a width measuring 4-5 meters wide. This has led to an increase in traffic accidents due to narrow and heavily potholed road conditions. Another road construction project still in progress by July 2023 is Kenol-Isiolo Road (A2), the 219 Kilometers highway is being built in two segments: Kenol-Marua (84km) and Marua-Isiolo (135km). Plans for the dual carriageway received a major boost in July 2020 following the start of the Sh16 billion Kenol-Marua segment of the road project.

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The Problem

Several studies conducted have linked resource risk management strategies with road construction project delivery. Research by (Githere and Sang, 2021; Mongina and Moronge, 2021) has shown that failure of project managers together with project execution team comprising of the KeNHA Engineers, supervising Consultants, and the key persons of the Contractor to have agreed-upon procedures and framework to manage resource risk was resulting to poor project performance and delay in completion of road construction projects. Despite these researchers adding knowledge to resource risk management strategies in road construction, there is an unanswered question of to what extend do resource risk management strategies influence the road construction project delivery of the selected road construction projects in Kenya, which is the knowledge gap this study sought to fulfill.

The Objective

The main objective of this study was to determine the influence of Resource Risk Management Strategies on delivery of road construction projects in Kenya.

The Hypothesis

The null hypothesis for this study was **H_{01}:** Resource Risk Management Strategies have no significant effect on time-cost overrun in selected road construction projects in Kenya.

LITERATURE REVIEW

Enterprise Risk Management Theory

Enterprise Risk Management theory is a framework that focuses on adopting a systematic and consistent approach to managing all of the risks confronting the project. However, Mcshane, Bromiley, Nair, and Rustambekov (2018) argue that ERM is still in its infancy because little academic research has been published in management Journals concerning ERM. The ERM being the main theory in this study helped in understanding how the project contractors and project owners manage resource risks that arise during project implementation.

Resource Risk Management Strategy and Project Delivery

Resource Risk Management Strategy is the elimination of hazards, activities and exposures that can negatively affect an organization and its assets (Pratt, 2023). According to Abdi (2020), the implementation of effective resource risk management strategies significantly and positively influences project delivery. Some of the indicators of effective resource risk management strategies include, sufficient material to run through the project, having enough equipment for the project, and financial capability to cater for the daily operations of the project.

Empirical Review

Resource Risk Mangement Strategy

Seid, Devadoss, and Fekadu (2019) in their paper "*Risk Management Practices in Road Construction Projects*", investigated resource risk management strategy on road construction projects in Addis Ababa City in Ethiopia. The finding of the study revealed that delay in possession of the site is the highest significant risk factor among delay in payments and defective design, which are ranked second and third respectively. This study does not show the extent to which each independent variable affects the dependent variable. The current study used inferential statistics utilizing multiple linear regression analysis to show how and to what extent resource risk management strategy affects road construction projects delivery in the Kenyan Context.

RESEARCH METHODOLOGY

Research Design and Data Collection

This study used an explanatory research design that tries to understand a problem that has not been conclusively researched. Target population included all the employees in the management level of the Nairobi Expressway road project (Musyoka, 2020), Isebania-Kisii-Ahero Road Rehabilitation project, and Kenol-Isiolo Road construction project. Primary data were collected using questionnaires. Secondary data were collected by downloading documents and getting relevant materials from the internet. The documents or materials included reports of African Development Bank Group financial reports of these roads, Reports of Auditor General, newspapers, books, and magazines.

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Population and Sample

The target population for this study included all the employees in the management of the Nairobi Expressway road project, Isebania-Kisii-Ahero Road Rehabilitation project, and Kenol-Isiolo Road construction project. The unit of analysis being all the employees in the management level of the Nairobi Expressway road project Isebania-Kisii-Ahero Road Rehabilitation project, and Kenol-Isiolo Road construction project. The sampling frame comprised 45 employees in the management level of the three roads. The study used a purposive sampling technique to select respondents who were in the management.

DATA ANALYSIS, DISCUSSION AND INTERPRETATION

Data Analysis

Quantitative data were analyzed by calculating the response rate with descriptive statistics such as means, median, standard deviation, and percentages using the statistical package for social sciences (SPSS) version 28. The analyzed data were presented by the use of graphs, and frequency tables. The qualitative data were analyzed using content analysis where common themes were placed together and then subjected to descriptive statistics.

Response Rate

Structured questionnaires were administered to foremen, ministry officer, engineers, project auditor, managers, surveyor, and county officer of the three selected road construction road projects. The findings of response rate are presented in Table 1.

Table 1 Response Rate

Questionnaire	Numbers	Percentage
Correctly filled	40	88.89
Not returned	5	11.11
Total	**45**	**100**

The results in Table 1indicate that 40 questionnaires were completely filled and returned, which is 88.89% response rate. According to Fincham (2018) for a small sample size a high response rate of 80% and above is better to reduce nonresponse bias. On the same note, Kothari (2006) contends that a response rate of 70% is appropriate for data analysis. Therefore, the response rate in this study was a sufficient representation of the target population that can be reliable for further data analysis.

Reliability Test

Reliability refers to the extent that the instrument yields the same results over multiple trials. It is verified by the consistency of the observation of an outcome. The same research instruments were administered twice, one week after the first one which was then followed by calculation of the reliability coefficient to test consistency using Cronbach's alpha formula. A correlation coefficient of 0.70 at 95% level of significance is generally suitable and is used by most researchers (Mugenda, 2010). Coefficient of above 0.7 were used since they indicate that the data is reliable and thus the suitability of the research instruments.The results of reliability test are shown in Table 2.

Table 2 Reliability Analysis

Variable	Number of items	Cronbach alpha
Resource Risk	10	0.860

The results in Table 2 show that cronbach's alpha for all the items were all above 0.7 implying that the instrument was sufficiently reliable for measurement. Since the variable measured had a cronbach's alpha of above 0.7, it was accepted. The data collected can thus be generalised to reflect the opinion of the respondents in the target population.

Descriptive Analysis of the Influence Resource Risk Management Strategies on Project Delivery

The first objective of this study was to examine the influence of the risk avoidance strategy on time-cost overrun in selected road construction projects. Data were collected using structured questionnaires, which included both closed- and open-ended questions. Descriptive statistics including frequencies (percentages), means (M), and standard deviations (STD) were used to summarize and interpret the responses. The respondents rated their level of agreement with various statements on a five-point Likert scale, where: Strongly Agree (SA) = 5, Agree (A) = 4, Uncertain (U) = 3, Disagree (D) = 2, Strongly Disagree (SD) = 1. The results were summarized in Table 3.

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Table 3: Descriptive Statistics of Risk Avoidance Strategy Sub-Variables

(N=40)

Sub-Variable	SA (%)	A (%)	U (%)	D (%)	SD (%)	M	STD
Adequate supply of materials	47.5	40.0	5.0	5.0	2.5	4.25	0.95
Availability of plants and equipment	17.5	67.5	10.0	2.5	2.5	3.95	0.78
Use of high-quality materials	27.5	55.0	10.0	5.0	2.5	4.00	0.91
Low staff absenteeism	62.5	25.0	7.5	2.5	2.5	4.53	0.93
Purchase of expensive materials	0.0	5.0	52.5	42.5	0.0	2.63	0.59
Staff overwork	0.0	2.5	20.0	62.5	15.0	2.10	0.67
Constant hiring and firing	32.5	60.0	7.5	0.0	0.0	4.25	0.59
Availability of efficient machinery	17.5	35.0	7.5	27.5	12.5	3.18	1.36
Existence of clear succession plans	22.5	67.5	10.0	0.0	0.0	4.13	0.56
Use of appropriate technology	55.0	35.0	7.5	2.5	0.0	4.43	0.75
Aggregate Score						**3.75**	**0.81**

***Note**: M = Mean; STD = Standard Deviation*

From the results in Table 3, several observations can be made regarding the influence of risk avoidance strategies on time-cost overrun in road construction projects. A significant proportion of respondents (62.5%) strongly agreed that low staff absenteeism was a critical risk avoidance practice implemented by construction firms, with a high mean score of M = 4.53 and STD = 0.93**.** This suggests that maintaining consistent workforce availability contributed to reduced disruptions, thereby minimizing project delays and cost overruns.

Another key strategy identified was the use of appropriate technology, with 55% of respondents strongly agreeing (M = 4.43, STD = 0.75). This finding implied that the integration of modern technologies into project design and implementation processes enhances efficiency and contributes to on-time and within-budget project delivery. On the contrary, overworking of staff was rated poorly, with a majority (62.5%) disagreeing and 15% strongly disagreeing with the statement, yielding a low mean score of M = 2.10 and STD = 0.67. This indicated that overworking of employees was not prevalent; potentially contributing to better staff performance, job satisfaction, and retention—factors that collectively reduce project disruptions.

The sub-variable on efficient machinery received a moderate mean score of M = 3.18 and STD = 1.36, reflecting mixed perceptions among respondents, possibly due to variability in access to or maintenance of construction equipment across different projects. Most of the remaining sub-variables yielded standard deviations below 1, indicating relatively low variability in responses and suggesting consensus among participants regarding the strategies applied.

Factor Analysis

Table 4: Factor Loadings for Resource Risk Management Strategy Sub-Variables

(N=40)

Statements	Factor loading
Adequate supply of construction materials	0.748
Availability of all plants and equipment	0.762
Construction materials provided are of high quality	0.533
The company works to reduce workers absenteeism	0.653
Procurement of expensive materials	0.749
Employees are overworked	0.578
Constant hiring and firing of employees	0.625
The vehicles, plants, and equipment work efficiently	0.596
The company has a clear succession plan	0.706
There is use of appropriate technology	0.752

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To evaluate the convergent strength of the hypothetical construct of risk avoidance strategy factor analysis was conducted. The analysis was conducted on the ten sub-variables of risk avoidance strategy. Table 4 presents the results obtained.

The factor loading results presented in Table 4 demonstrated that all the sub-variables met the minimum threshold of 0.5, as recommended by Yim (2019), confirming their strong association with the underlying construct of resource risk management strategy. The sub-variable "Availability of plants and equipment before project commencement" had the highest factor loading (0.762), indicating it is the most strongly related indicator of the construct. Similarly, high loadings were observed for "Use of appropriate technology" **(**0.752), "Purchase of expensive materials and high salaries" **(**0.749), and "Adequate supply of construction materials" (0.748), suggesting that these factors play a significant role in shaping the resource risk management practices of road construction firms.

Other sub-variables, including "Reduction in workers' absenteeism" (0.653), "Constant hiring and firing" (0.625), and "Efficient functioning of machinery" (0.596) also exhibited acceptable loadings, reinforcing their relevance in explaining resource risk behavior. The lowest loading among the set was "Provision of high-quality construction materials" at 0.533, though it still surpassed the acceptable threshold, thereby validating its inclusion in the construct. The uniformly strong factor loadings across all ten items support the validity of aggregating these indicators under the broader construct of resource risk management strategies. As such, the resulting factor scores were deemed suitable for use as independent variables in subsequent linear regression analysis, where their influence on time-cost overrun in road construction projects was evaluated.

These results provided empirical evidence that the identified items collectively and reliably captured the dimension of resource risk management strategy, thereby reinforcing the robustness of the construct measurement and ensuring consistency in subsequent inferential analysis.

Regression Analysis for Resource Risk Management Strategy

The hypothesis of the study was stated as:

H_{01} *Resource risk management strategies have no significant effect on delivery of road construction projects in Kenya*.

Regression analysis was conducted to determine whether there was a significant relationship between resource risk management strategy and project deliveries. Table 5 presents the regression model on resource risk management versus project delivery.

Table 5: Model Summary for Resource Risk Management Strategy

Model	R	R^2	R^2_{Adj}	S. E
1	.359[a]	.129	.106	.29009

a. Predictors: (Constant), Resource
b. Dependent variable: project deliveries

As presented in Table 5, the coefficient of determination R^2 =0.129 and R= 0.359 at 0.01significance level. The model indicates that resource risk management strategy explained 12.9% of the variation in project delivery (R^2=0.129). In other words, 12.9% of the project deliveries were influenced by resource risk management strategies.

These findings suggested that greater implementation of resource risk management measures such as ensuring availability of materials, use of appropriate technology, and reducing absenteeism contributes significantly to the performance in road construction projects. Consequently, the null hypothesis (**H_{01}**) was rejected. This implied that resource risk management strategy exerts a significant influence on the performance of road construction projects.

These results aligned with findings by Abdi (2020), who noted that risk management strategies such as hiring qualified personnel and ensuring material availability contributed to improved project performance. Similarly, Saviom (2021) emphasized the role of proactive risk policies in boosting staff morale and improving the performance of the road construction projects.

Conversely, Seid et al. (2019) identified challenges such as low staff commitment and poor communication of resource risk management measures, which hindered the effectiveness of such strategies. However, these limitations were not prominent in the current study's context, possibly due to better organizational alignment and execution.The Analysis

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of Variance (ANOVA) was done to further assess the relationship between resource risk management strategies and project delivery. The coefficient results of the analysis are shown in Table 6.

Table 6: Coefficients for Resource Risk Management Strategy

Model		β	S. E	*β*	t	*p*
1	(Constant)	2.832	.543		5.218	.000
	Resource	.344	.145	.359	2.371	.023

The fitted model from the result is

$Y = \beta_0 + \beta_2 X + €$

$= 2.832 + 0.344X + 0.290$

This implied that a unit change in resource risk management strategy would increase project delivery by the rate of 0.344.

In terms of significant association between resource risk management with project delivery, the null hypothesis "Resource risk management strategy has no significant effect on delivery of road construction projects in Kenya" was rejected. The accepted alternative hypothesis for the sample investigated is that resource risk management has a positive significant influence on project delivery of road construction projects in Kenya. The result of this study corroborated with study conducted by Abdi (2020), who revealed that resource risk management practices have a positive and significant effects on project performance.

The results further aligned with the Institutional Theory, which posits that organizational compliance with industry norms and legal frameworks enhances legitimacy and performance. In this study, adherence to standardized procedures such as safety protocols and succession planning were associated with better project timelines and cost control.

In addition, the findings resonated with Enterprise Risk Management (ERM) Theory, which emphasizes a structured, organization-wide approach to identifying and managing risks. The presence of a proactive risk culture within the firms under study appeared to facilitate early detection and mitigation of potential delays and cost escalations (Mursi, 2022).

The significant positive effect of resource risk management strategies on project performance highlights their value in managing construction risks. Road construction companies are therefore encouraged to institutionalize resource risk management practices such as early procurement, use of efficient machinery, and employee welfare policies to enhance schedule adherence and budget compliance.

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

Road construction companies are encouraged to institutionalize resource risk management practices such as early procurement, utilization of efficient machinery, and the implementation of employee welfare policies to enhance schedule adherence and budget compliance. Firms that effectively embrace resource risk management strategies can better address issues related to material delays, vehicle malfunctions, and absenteeism of competent workers, thereby improving the performance of the road construction projects. Based on the findings, the study concluded that resource risk management strategy significantly influences project delivery of road construction project. A Company that sorts out issues related to delay of material, malfunction of vehicles, and absenteeism of competent workers thrives in delivery of road construction projects.

Policy Implications

The current study therefore strongly recommends that more research be done in the field of risk management. This is to help unearth some more strategies of risk management that can be influential in terms of helping road construction firms meet the deliverables that are desired within time and cost constraints. There is need for road construction company management to deepen the application and implementation of risk avoidance, risk reduction, and insurance risk transference strategies within the sector. This can be achieved through increased engagement in capacity-building activities focused on risk management and construction project management.

Such efforts would equip project managers with the necessary tools and techniques to effectively execute construction projects, while also ensuring employee safety and motivating the retention of competent workers.

Additionally, road construction firms should adopt risk reduction strategies that focus on enhancing human resource capabilities by promoting competence, productivity, effective communication, and ongoing training. This will enable organizations to keep pace with technological advancements and evolving industry demands. Creating awareness among clients about the importance and benefits of risk management practices is also crucial for encouraging greater uptake and compliance. Finally, road construction firms should embrace dynamic capabilities to improve the timely and successful completion of projects within budget, without compromising on quality.

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