

Effect of Risk Reduction on Performance of Rural Roads Projects in Nyandarua County, Kenya

Isaac Maina Gachomo¹, Dr. Daniel M. Wanyoike, Ph.D²

¹,Student, Business Administration (Project Management) Jomo Kenyatta University of Agriculture & Technology, Kenya.

²,Lecturer Jomo Kenyatta University of Agriculture and Technology

Problem Statement: The Nyandarua County Integrated Development Plan 2023 indicates that just 32% of initial road projects were completed on schedule and under budget, leaving a concerning 68% unfinished and subject to cost overruns. Despite the County Government acknowledging the return of monies allocated for development projects to the National Treasury, this indicates a deficiency in effective project risk mitigation measures (County Government of Nyandarua, 2023).

General objective of the study: To investigate how risk reduction affects performance of rural road projects in Nyandarua County, Kenya

Research Design: The study adopted a descriptive research design.

Finding: Risk Reduction showing significance ($B = 0.048$, Sig. = 0.035), suggesting that implementing these strategies can effectively enhance project performance.

Conclusions: The findings demonstrate a strong consensus among respondents regarding the substantial benefits of implementing risk reduction strategies in rural road projects. These strategies are seen to significantly improve response times and facilitate quicker decision-making, which positively influences project timelines.

Recommendation: To leverage the substantial benefits of risk reduction strategies in rural road projects, it is recommended that stakeholders prioritize the integration of these strategies throughout all phases of project planning and execution. This includes conducting comprehensive risk assessments to identify potential challenges early on and implementing proactive measures to mitigate them.

Keywords: risk reduction, performance of rural road projects

I. INTRODUCTION

Risk is defined as the likelihood of experiencing monetary and economic losses or profits as a result of unknowns associated with making an investment (Karoney, 2020). Since hazards are ever-present, risk reduction is essential for every company. These risks stem from a number of factors, such as the development of technology, which creates a channel for cybercrime, the challenging economic conditions that lead to non-performing loans, and increased competition, which makes businesses more vulnerable as they try to adapt to new trends (Gitonga & Barasa, 2021). Infrastructure projects, particularly road projects, are vital to societies because they help to converge the needs for economic growth and, more significantly, to improve the quality of life for their population (Matu et al., 2020).

Numerous risk factors are present in large-scale, intricate construction projects, and effective risk management is essential to their successful completion (Sharma & Gupta, 2021). The method of risk management has several advantages, such as the ability to identify and evaluate potential risks as well as improve resource utilisation and construction project management procedures (Nerija & Audrius, 2021). Timeliness, cost, and quality have historically

been linked to the success of building projects (Nerija & Audrius, 2021). Time monitoring seeks to assess a project's performance within a certain timeframe with respect to the planned schedule (Mahmoud, 2020).

. The term "risk reduction" describes taking early action to lessen the effect or likelihood that a risk may materialise (Newton, 2021). Risk reduction is defined as the process of decreasing a risk's magnitude, likelihood of occurrence, or effect in order to make it more acceptable to the organisation. Risk reduction in this project will be quantified in terms of improved reaction times, standard compliance, and quality control.

The Kenyan government, in collaboration with its development partners, has made substantial expenditures in road projects to promote national and regional development, enhancing interconnectivity and social accessibility. Nyandarua County is one of the locations where these road construction have commenced. Nyandarua County is one of the 47 counties of Kenya, formerly situated in the old Central Province. According to the 2019 National Census, Nyandarua County has a population of 638,289 people. The county has five constituencies: Kinangop, Kipipiri, OI Kalou, Ndaragwa, and Oljororok, with an area of 3,304 square kilometres. Additionally, the county is partitioned into 25 wards.

II. STATEMENT OF THE PROBLEM

The Kenyan government has implemented many initiatives to enhance the efficacy of road development projects. KENHA, KURA, and KERRA were established after the enactment of the Kenya Roads Act in 2007. The objective was to provide a legislative and administrative framework for the building, rehabilitation, and maintenance of roads (Ministry of Transport and Infrastructure, 2020).

Notwithstanding governmental efforts, road development projects in Kenya often face impediments, leading to inadequate performance. The KPMG (2023) research indicates that only 39.4 percent of projects are completed within budget and schedule restrictions, while just 35% achieve the requisite quality criteria. Wambui (2021) ascribes project failures to temporal inefficiencies, inadequate money, and a lack of sophisticated technology. The KURA report of 2023 indicates that projects remain unfinished owing to client-related problems, material shortages, budgetary limitations, and inadequacies in project management skills. The concerns highlight systemic issues in the construction industry, requiring a holistic strategy to tackle financial, logistical, and administrative limitations to enhance project results and promote sustainable infrastructure development in Kenya.

The connection index of Nyandarua is inadequate. Advancements in the enhancement of the C69 Njabini – Dundori road to bitumen, along with subsequent maintenance efforts; the resurfacing of the Gilgil - Nyahururu road; the finalisation of the Boiman - Nyahururu road; and ongoing projects on the Mairo-inya – Subuku road, Dundori – Ol'joro Orok road, and Gilgil-Tumaini roads have significantly improved transportation and communication within the county. The enhancement of additional essential roads at the ward level to gravel standards is now underway but remains unfinished. Prior research has been undertaken about the performance of road projects (Ochenge, 2022; Muchelule, 2022; Kissi, 2019). These studies reveal several study gaps, including contextual, conceptual, empirical, and methodological deficiencies that they aim to address.

The Nyandarua County Integrated Development Plan 2023 indicates that just 32% of initial road projects were completed on schedule and under budget, leaving a concerning 68% unfinished and subject to cost overruns. Despite the County Government acknowledging the return of monies allocated for development projects to the National Treasury, this indicates a deficiency in effective project risk mitigation measures (County Government of Nyandarua, 2023).

SPECIFIC OBJECTIVES

- i. To investigate how risk reduction affects performance of rural road projects in Nyandarua County, Kenya.

RESEARCH HYPOTHESES

H₀: Risk reduction has no statistical significant effect on performance of rural road projects in Nyandarua County, Kenya.

LITERATURE REVIEW

THEORETICAL REVIEW

Theory of Constraints

Theory of restrictions (TOC) is a management framework that asserts that any controllable system encounters restrictions that hinder the attainment of its organisational objectives (Goldratt, 1990). The Theory of Constraints (TOC) will serve as the primary framework for this research, since it examines the full construction value chain from inception

to completion. The TOC mostly adopts a process-oriented perspective on Performance and identifies the rate-determining phases, which are the most crucial factors influencing project performance and, therefore, overall Performance. Upon resolution, these factors significantly improve workflow and the efficient allocation and distribution of organisational resources.

According to the Theory of Constraints, in the absence of limitations hindering an organization's throughput, its sales revenues would be limitless. However, this is unfeasible in a real-world system; only by optimising flow across the restrictions can total throughput be maximised. Constraints may be internal, characterised by the system's inability to produce enough supply to meet demand, or external, when supply surpasses need. To streamline processes via constraints, the Theory of Constraints (TOC) delineates five essential steps: identifying system constraints, formulating strategies to exploit these constraints, prioritising these strategies, augmenting capacity at the constraints, and monitoring and enhancing the system through requisite feedback loops. The five concentrating phases, referred to as the Process of Ongoing Improvement (POOGI), centre upon the identified system limitations (Goldratt, 1990).

When using TOC in the risk management of construction projects, it is acknowledged that both current and prospective restrictions may evolve into project hazards. In reality, during the first assessment of construction project hazards, project management emphasises recognising the most significant risks involved (Steyn, 2002). Risk events are prioritised based on their potential effect at each stage of a project. This indicates that, during the project life cycle, certain risks tend to exhibit varying degrees of criticality as the project advances. The feedback loop inherent in the last concentrating stage of the TOC strategy guarantees successful management of risk events by persistently mitigating the most significant current risk, thereby assuring a steady, continuous, and systematic reduction of total risk. This guarantees that limited resources are allocated to mitigate risks that might negatively affect the project at any moment, ensuring that emerging hazards get appropriate attention for resource distribution at the appropriate phase. Ultimately, this accelerates project performance and has a multiplier impact on overall performance. The Theory of Constraints connected the research to proactive risk mitigation techniques in Nyandarua County, therefore strengthening road project performance, reducing delays, and improving overall project results. This comprehensive strategy offered a cohesive framework for enhancing project efficiency while mitigating possible obstacles.

Agency Theory

This theory was proposed by Smith and Stulz in 1985. The agency theory extends the firm's analysis to include ownership and control separation as well as management incentive. In the context of corporate risk management, it has been shown that agency concerns affect managers' attitudes toward taking risks and hedging. The theory also clarifies how disparities in the allocation of earnings might lead to a possible conflict of interest between debt holders, shareholders, and management. This may result in the company taking on undue risk or refraining from working on initiatives with positive net value (Mayers & Smith, 2012). Consequently, agency theory implies that the specified hedging practices of enterprises may have a substantial effect on their values (Fite & Pfleiderer, 1995).

A few research (Faff & Nguyen, 2012) have empirically examined the detrimental effects of managerial motivation elements on the corporate risk management implementation. If there is no traditional equity-owner who assumes residual risk and guarantees debt repayment, project-financing arrangements are often accompanied by complex and detailed contracts that specify the exact nature and duration of the relationships between the project's various participants. It is crucial to carefully identify the risks that might occur at any point throughout the project's lifecycle, from planning to execution, and to assign them to the participants who have the greatest capacity to handle them (Zou, Zhang & Wang, 2013).

To handle different kinds of risk, the project sponsor or financial adviser may create a matrix of project participants and risk components. This matrix will show how risk is allocated as well as the different contractual arrangements that do so (Minato, 2012). The rivalry among project managers in managerial labor markets may lessen or eliminate agency risk (Hamimah, 2010). As a project becomes bigger, the two tasks usually allocated to the project manager—risk-taking and management—may be seen as intrinsically different elements of production inside a collection of contracts known as the project handled by the project management team. Even while each project stakeholder acts in their own self-interest, they are aware that their own personal fates have some effect on the project management team's performance in competition with other project management teams. The potential agency incentive issues related to the division of ownership and control of the project as the number of project stakeholders rises would typically be resolved by the discipline placed on project managers by managerial labor markets both inside and outside the project (Akintoye & MacLeod, 2012). Concepts from Agency Theory have an impact on the dynamics of the

principal-agent interaction in the context of rural road projects in Nyandarua County. This understanding resulted in improvements to contractual agreements, governance frameworks, and monitoring systems, all of which enhanced the road projects' overall performance.

The Stakeholder Theory

Stakeholder theory is a management theory that, as first put out by Freeman (1994), holds that the main goal of any given institution is to create value for its stakeholders. In accordance with this idea, expenses should be distributed fairly, and the agency principle should function transparently to guarantee that all parties involved in the business understand and accept their respective responsibilities. Similarly, the idea aims to ensure that a business will survive for a sufficient amount of time to benefit stakeholders and incorporate improvements in all initiatives. This permits audits to be carried out while averting potentially dangerous acts by chance-taking agents (Joyce, 2021)

According to stakeholder theory, an organization's capacity to provide value for its stakeholders largely determines how sustainable it will be. Put otherwise, if a business fails to provide value to stakeholders, then such stakeholders are under no obligation to stay involved. This suggests that in order to prevent opportunism from developing in the organization's operations and stakeholders' involvement, the beneficiaries and the entity must have a mutual interest in one another (Joyce, 2021).

Since stakeholders are not required to participate in the entity's activities, the stakeholder theory has come under fire for lacking a basis for engaging them. Similarly, if there is an obvious instance of operations collapsing because of a lack of funding or force majeure—a term that refers to unavoidable circumstances like war, conflict, and severe natural calamities—an entity may relocate without being held accountable by the interested parties (Jones et al., 2017). Stakeholder theory is also criticized for giving the impression that there is another passive power source among the stakeholders, undermining the entity management team's accountability. This suggests that senior management may work with stakeholders to sabotage the entity initiative in order to further their own selfish agendas (Freeman, Phillips & Sisodia, 2020).

The idea backs up the risk-sharing approach used in this research as it takes the opinions of stakeholders to assess a project's effectiveness or potential benefits. As they are better able to understand the advantages and disadvantages of risk avoidance, reduction, and sharing strategies, stakeholders may also have an impact on the design of these strategies. This is implied by the theory's guiding principles, which support the interests of all stakeholders. In the event that a project does not reach its full potential, it is essential that stakeholders be sufficiently informed about these tactics to avoid audit inquiries and consequently avert losses.

Risk reduction and performance of rural road projects

Barquet & Cumiskey (2018) evaluated the risk-reduction strategies in nine European coastal cities using a multi-criteria evaluation technique. The goal of their research was to develop a catastrophe risk reduction strategy that bridges the gap between engineering and social science. The political and economic components of stakeholder knowledge were taken into account by Barquet and Cumiskey when determining the most effective strategy for disaster risk mitigation strategies. The researchers used paper-based cards as part of their approach to ask questions of the local populace in the disaster areas. The evaluation's stakeholders were aware of some of the best strategic options for managing catastrophe risk reduction. Planning disaster risk reduction methods required careful consideration of stakeholder engagement and evaluation, as noted by Barquet and Cumiskey in their results.

Pertiwi, Llewellyn, and Villeneuve (2019) looked into Indonesian handicapped persons in order to show the value of risk reduction programs run by community organizations, especially disabled people's organizations (DPOs). The study examined reports from three of these DPOs in Indonesia, which are based on disaster-preparedness initiatives using a multiple case design method. The study's findings demonstrated that DPOs in Indonesia were in the forefront of creating community-based risk-reduction methods despite structural barriers. Another finding indicated that DPOs spearheaded measures for risk minimization. In their concluding suggestions, Pertiwi et al. (2019) noted the following: more DPOs should be included in disaster risk reduction planning, and mainstream stakeholders need to completely integrate disaster reduction activities with greater involvement and resource allocation.

Risk management is crucial in the construction sector (Etges, 2017). This element is essential for construction projects to be finished on time. Risk management strategies are the process of identifying, monitoring, and controlling

risks and their possible effects on a project (Nissen, 2019). These risk-related actions, according to (KURA, 2019), all carefully identified possible risks whose occurrences have an effect on the project's primary goals, which include completion cost, time, quality, scope, and yields..

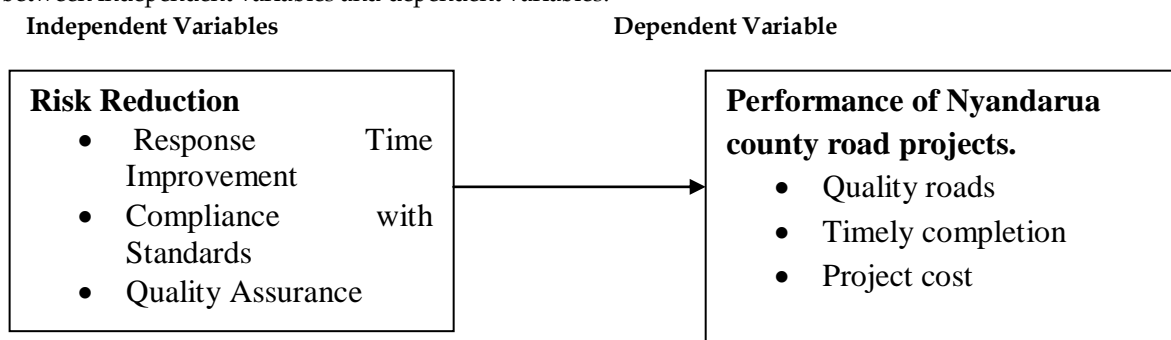
Ali, Stewart & Qureshi (2017) conducted a study in Pakistan to investigate the risk management practices adopted in Construction industry. The study adopted a descriptive research design the study target population consisted of construction practitioners, construction managers and construction project team. Questionnaires were successfully administered to 40 respondents and data collected was statistically analyzed using descriptive statistics and inferential statistics. Findings of the study implicated that the risk reduction strategies adopted by the construction company such as taking insurance and contingency plan influence completion of projects. The contextual gap was identified since this study was undertaken in Pakistan while the current study will focus on Performance of Nyandarua county road projects

Naji & Ali (2018) study examined risk reduction in construction projects. An optimization model was used to select the optimal strategy to treat the risk by using Serval constraints such as the cost of the project, time of the project, Gravitational Search Algorithm and particle swarm used. The result of the risk reduction shows that the investment (contractor, bank) strategy shows a very good strategy as it saves the cost about 30%, while the Mitigate (pay for advances with interest 0. 1strategy show saving the cost 40% and giving land to contractors show saving the cost 40% finally the BIM strategy show saving the cost 25%.

Njagi (2018) focuses on drought reduction strategies that integrate indigenous and conventional techniques with modern preparedness measures in Sub- County of North Mbeere of Kenya. The study applied a descriptive survey through purposive sampling to identify advanced age respondents with experience in the conventional drought prediction methods. Similarly, a questionnaire was distributed amongst the NGOs and community organizations while also supplementing the exercise with focused group interviews as well as key informant interview schedules. Both qualitative and quantitative techniques were used for data analysis. The analysis indicated rampant application of both indigenous and conventional methods in disaster risk reduction measures. The study focused on risk reduction in drought reduction while the current study will focus on risk reduction in roads projects.

CONCEPTUAL FRAMEWORK

According to Mathieson et al., (2018), a conceptual framework is a virtual or written product, one that explains either graphically or in narrative form, the main things to be studied. A conceptual framework explores the relationship between independent variables and dependent variables.



III. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

A descriptive survey design was used in the context of this study.

TARGET POPULATION

The study's target population consisted of 18 county-funded road projects in Nyandarua County. The unit of observation included 180 project participants from these 18 road projects, comprising 18 project managers, 20 consultants, 106 project implementation team members, and 38 community project representatives.

SAMPLING TECHNIQUE

A sample is a representative group under analysis obtained from a population of interest. Using Nassiuma’s formula, developed by Professor Stephen Nassiuma, in the year 2003 for sample calculation, with a population of 180 elements the sample can be calculated. With a sample of 65, the study used purposive sampling to target county-funded road projects in Nyandarua County. Purposive sampling was suitable because the targeted project members in each project were in a position to address the study objectives, as they were part of the decision-making process

DATA COLLECTION INSTRUMENT

The study used the questionnaire as the data collection instrument. Structured questionnaires were utilized since they guaranteed information with fewer incidences of bias and error. In this study, using questionnaires for data collection was a realistic alternative because they provided various benefits.

DATA ANALYSIS AND PRESENTATION

Before embarking on data analysis, the researcher carried out data cleaning to ensure that unfilled or incorrectly filled questionnaires were identified and isolated. The collected data was analyzed quantitatively by first coding and then analyzing it using Statistical Package for Social Science (SPSS) version 26.0. The collected data was analyzed using both descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistics (regression and correlation). The study hypothesizes the following model:

$$Y = \beta_0 + \beta_1 X_1 + \epsilon$$

Where;

Y= Performance of rural road projects

e= error term,

X₁= Risk Reduction

FINDINGS AND DISCUSSIONS

Risk reduction and performance of county funded roads projects

The study was to investigate how risk reduction affects performance of county funded roads projects in Nyandarua County, Kenya.

Responses	Descriptive Statistics					Mean	Std. Deviation
	Strongly disagreed	Disagree	Undecided	Agree	Strongly Agree		
The implementation of risk reduction strategies contributes to a noticeable improvement in response times during rural road projects	5%	5%	7%	38%	40%	4.072	1.103
Adequate risk reduction measures result in quicker decision-making processes, positively impacting project timelines.	5%	5%	7%	38%	40%	4.072	1.103
Projects that focus on risk reduction consistently meet and exceed established standards for rural road construction.	5%	5%	12%	38%	35%	3.963	1.104
Adequate risk reduction positively influences the project's ability to adhere to local and national standards in rural road projects	7%	9%	9%	33%	38%	3.909	1.236

Effect of Risk Reduction on Performance of Rural Roads Projects in Nyandarua County, Kenya

Risk reduction strategies contribute to enhanced quality assurance measures in the execution of rural road projects	10%	9%	12%	28%	37%	3.745	1.350
Adequate risk reduction positively impacts the project's ability to deliver high-quality results and outputs	5%	9%	10%	37%	35%	3.909	1.159
The reduction of risks is associated with improved overall quality assurance throughout the project lifecycle	12%	12%	7%	31%	33%	3.636	1.405
Overall mean						3.912	1.208

The majority of the respondents concurred that the implementation of risk reduction strategies contributes to a perceptible improvement in response times during rural road projects, with a mean of approximately 4.072 and a standard deviation of 1.103, as per the findings. The results further demonstrated that the implementation of appropriate risk reduction measures leads to faster decision-making processes, which in turn has a positive effect on project timelines. This is also supported by a mean of approximately 4.072 and a standard deviation of 1.103. Moreover, the respondents were of the opinion that projects that prioritise risk reduction consistently surpass and meet the established standards for rural road construction, as demonstrated by a mean of approximately 3.963 and a standard deviation of 1.104. They also concurred that the project's capacity to comply with local and national standards is positively impacted by the implementation of effective risk reduction, with a mean of approximately 3.909 and a standard deviation of 1.236. Moreover, a mean of approximately 3.745 and a standard deviation of 1.350 suggested that risk reduction strategies were perceived to contribute to improved quality assurance measures in the execution of rural road projects. The respondents also observed that the project's capacity to produce high-quality outputs and results is positively influenced by the implementation of effective risk reduction strategies, with a mean of approximately 3.909 and a standard deviation of 1.159. In conclusion, the results indicated that the reduction of risks is correlated with enhanced overall quality assurance throughout the project lifecycle, with a mean of approximately 3.636 and a standard deviation of 1.405. These findings align with research by Osei-Kyei and Chan (2017), who explored risk management strategies in infrastructure projects. They found that well-implemented risk reduction measures contribute to swift decision-making and responsiveness, particularly in complex projects such as rural road construction. This is consistent with Hillson and Murray-Webster (2017), who found that projects with strong risk management frameworks often achieve or exceed set standards and expectations. This happens because risk reduction measures ensure a more predictable and stable project environment. This is supported by Zwikael and Ahn (2021), who examined the role of risk management in infrastructure projects and found that projects with robust risk strategies are more likely to meet regulatory and legal requirements. Their research suggests that effective risk reduction allows for better planning and alignment with local and national laws. The overall mean of 3.912 and a standard deviation of 1.208 indicates that, on average, respondents generally agree with the statements regarding the positive impact of risk reduction strategies on rural road projects. With the mean close to 4, it suggests a trend toward agreement, but not overwhelming consensus, as there is still a moderate spread of responses across the scale.

Performance of county funded roads projects in Nyandarua County.

The respondents were asked to indicate their level of agreement on performance of county funded roads projects in Nyandarua County, Kenya.

Descriptive Statistics							
Responses	Strongly disagreed	Disagree	Undecided	Agree	Strongly Agree	Mean	Std.
The overall condition and durability of roads meet or exceed expectations	3%	3%	7%	38%	47%	4.218	.994
Road safety features (signage, lighting, etc.) are adequate and contribute to a secure driving experience.	5%	9%	7%	51%	27%	3.854	1.095

Effect of Risk Reduction on Performance of Rural Roads Projects in Nyandarua County, Kenya

Projects are consistently completed within the specified timelines	7%	11%	5%	45%	31%	3.818	1.203
Delays in project completion are minimal and well-communicated	14%	14%	7%	27%	36%	3.563	1.475
The overall efficiency in project timelines meets or exceeds expectations	5%	5%	14%	36%	38%	3.963	1.121
There are minimal unexpected cost overruns or additional expenses	7%	11%	9%	45%	27%	3.745	1.189
The overall value for money in terms of project costs is satisfactory	9%	9%	14%	45%	22%	3.618	1.193
Overall Mean						3.826	1.181

The majority of respondents concurred that the overall condition and durability of roads meet or exceed expectations, with a mean of approximately 4.218 and a standard deviation of 0.994, as indicated by the results. The results also suggested that road safety features, including illumination and signage, are sufficient and contribute to a secure driving experience, as evidenced by a mean of approximately 3.854 and a standard deviation of 1.095. Furthermore, respondents were of the opinion that projects are consistently completed within the designated timelines, as demonstrated by a mean of approximately 3.818 and a standard deviation of 1.203. Nevertheless, they observed that the delays in project completion are minimal and well-communicated. The standardised deviation of 1.475 and a lower mean of approximately 3.563 suggest that there is a larger degree of variability in the responses regarding this aspect. The findings also demonstrated that the overall efficacy of project timelines meets or exceeds expectations, as evidenced by a mean of approximately 3.963 and a standard deviation of 1.121. In addition, respondents noted that there are minimal unexpected cost overruns or additional expenditures, as evidenced by a mean of approximately 3.745 and a standard deviation of 1.189. Lastly, the overall value for money in terms of project expenditures was deemed adequate, with a mean of approximately 3.618 and a standard deviation of 1.193. The findings agree Benmaamar (2016), which found that continuous investment in road maintenance leads to higher durability and longer life expectancy for roads. Durability is a critical measure of project success, especially in rural areas where roads are subjected to varying weather conditions and heavy use. The overall mean of 3.826 and a standard deviation of 1.181 indicates that respondents generally agree with the statements regarding the quality, safety, timelines, and cost efficiency of rural road projects. With the mean close to 3.8, there is a tendency toward agreement, but some variability exists in opinions.

Correlation between risk reduction and performance of county funded roads

		Performance of county funded roads
Risk Reduction	Pearson Correlation	.666**
	Sig. (2-tailed)	.006
	N	55

** . Correlation is significant at the 0.05 level (2-tailed).

Source: Research data 2024

The Pearson correlation coefficient of 0.666** suggests a strong positive correlation between the performance of county funded roads and risk reduction, with a significance level of 0.006 ($p < 0.05$). This implies that the performance of these roads improves in tandem with the implementation of risk reduction measures. It is crucial to incorporate risk reduction practices into the planning and execution of county road projects in order to achieve improved outcomes, as the significant correlation suggests that effective risk management strategies may improve road quality and functionality. The positive relationship between risk reduction and project performance is supported by studies on infrastructure projects, where risk reduction practices, such as identifying potential project risks early and mitigating them, are shown to enhance project outcomes. According to Flyvbjerg et al. (2013), systematic risk reduction strategies, like contingency planning and proactive problem-solving, improve project efficiency, reduce delays, and ensure the long-term functionality of infrastructure projects.

IV. CONCLUSIONS OF THE STUDY

The findings demonstrate a strong consensus among respondents regarding the substantial benefits of implementing risk reduction strategies in rural road projects. These strategies are seen to significantly improve response times and facilitate quicker decision-making, which positively influences project timelines. Respondents believe that projects focusing on risk reduction consistently meet or exceed construction standards and enhance adherence to both local and national regulations. Additionally, these strategies are credited with improving quality assurance during project execution and delivering high-quality outputs, contributing to overall quality throughout the project lifecycle. The strong positive correlation between risk reduction and the performance of county funded roads underscores the critical importance of integrating effective risk management practices in the planning and execution phases of road projects to achieve better outcomes.

RECOMMENDATIONS OF THE STUDY

To leverage the substantial benefits of risk reduction strategies in rural road projects, it is recommended that stakeholders prioritize the integration of these strategies throughout all phases of project planning and execution. This includes conducting comprehensive risk assessments to identify potential challenges early on and implementing proactive measures to mitigate them. Training for project teams on effective risk management practices should be emphasized to enhance their capacity to make timely decisions and adapt to changing conditions. Additionally, establishing a framework for continuous quality assurance can ensure that projects consistently meet or exceed construction standards while adhering to local and national regulations. Stakeholders should also engage in regular evaluations of risk reduction strategies to measure their effectiveness and adjust approaches as needed. By fostering a culture that values risk reduction, project outcomes can be significantly improved, leading to higher quality road infrastructure that benefits the community.

REFERENCES

- [1] Aduma, L. K., & Kimutai, G. (2018). Project risk management strategies and project performance at the National Hospital Insurance Fund in Kenya. *International Academic Journal of Information Sciences and Project Management*, 3(2), 80-110.
- [2] Adeleke, A. Q., Bahaudin, A. Y., Kamaruddeen, A. M., Bamgbade, J. A., Salimon, M. G., Khan, M. W. A., & Sorooshian, S. (2018). The influence of organizational external factors on construction risk management among Nigerian construction companies. *Safety and health at work*, 9(1), 115-124.
- [3] Akinradewo, O. F., & Omoraka, A. E. (2020). Factors Influencing the Cost Performance of Traditional and Public-Private Partnership Procured Housing Projects in Nigeria. In *The Construction Industry in the Fourth Industrial Revolution: Proceedings of 11th Construction Industry Development Board (CIDB) Postgraduate Research Conference 11* (pp. 22-33). Springer International Publishing.
- [4] Al-Hashimi, A. M. G. A., & Masuri, M. R. B. A. (2022). The Effect of Risk Management and Project Manager's Skills on the Performance of Construction Projects in United Arab Emirates. *resmilitaris*, 12(3), 2910-2924.
- [5] Agumba, (2023). Evaluating the causes of poor delivery of Social Infrastructure Projects: A case of Limpopo and Mpumalanga provinces. *Association of Schools of Construction of Southern Africa*.
- [6] Ahmed, M. A., Khattak, M. S., & Anwar, M. (2022). Personality traits and entrepreneurial intention: The mediating role of risk aversion. *Journal of Public Affairs*, 22(1), e2275.
- [7] Alavi, H., & Nadir, S. L. (2020). Risk analysis in construction phase of oil and gas projects: A critical literature review. *Multidisciplinary Aspects of Production Engineering*, 3(1), 668-680.
- [8] Authority, K. R. R. (2020). Ministry Of Transport & Infrastructure State Department For Infrastructure
- [9] Barquet, K., & Cumiskey, L. (2018). Using participatory Multi-Criteria Assessments for assessing disaster risk reduction measures. *Coastal Engineering*, 134, 93-102.
- [10] Boateng, A., Ameyaw, C., & Mensah, S. (2022). Assessment of systematic risk management practices on building construction projects in Ghana. *International Journal of Construction Management*, 22(16), 3128-3136.
- [11] Clark, T., Foster, L., Bryman, A., & Sloan, L. (2021). *Bryman's social research methods*. Oxford university press.
- [12] Dandage, R. V., Mantha, S. S., Rane, S. B., & Bhoola, V. (2018). Analysis of interactions among barriers in project risk management. *Journal of Industrial Engineering International*, 14, 153-169.
- [13] Faff, R. W., Gharghori, P., Ip, B., & Nguyen, A. (2012). Return-based style analysis in Australian funds. *Multinational Finance Journal*, 16(3/4), 155-188.
- [14] Freeman, R. E. (2023). The politics of stakeholder theory: Some future directions. In *R. Edward Freeman's Selected Works on Stakeholder Theory and Business Ethics* (pp. 119-132). Cham: Springer International Publishin

- [15] Gebru, K. (2020). *Determinants of project success: the case of usaid funded project*
- [16] Gitonga, K. T., & Barasa, J. L. (2021). Risk Management and Profitability of Commercial Banks: Evidence from Kenyan Commercial Banks. *African Development Finance Journal*, 5(1), 17-32
- [17] Goldratt, E. M. (1990). *Theory of constraints* (pp. 1-159). Croton-on-Hudson: North River.
- [18] Irandu, E. M., & Owilla, H. H. (2020). The economic implications of belt and road initiative in the development of railway transport infrastructure in Africa: The case of the standard gauge railway in Kenya. *The African Review*, 47(2), 457-480.
- [19] Johnson, R. M., & Babu, R. I. I. (2020). Time and cost overruns in the UAE construction industry: a critical analysis. *International Journal of Construction Management*, 20(5), 402-411.
- [20] Jones, T., Jones, S., Elliott, K. C., Owens, L. R., Assalone, A. E., & Gándara, D. (2017). Outcomes based funding and race in higher education: Can equity be bought.
- [21] Juma, A. A. Z. O., Perumal, P. A., & Mansoor, N. (2022). Exploratory Analysis of Risk Management Process of UAE Police Department. *International Journal of Sustainable Construction Engineering and Technology*, 13(4), 30-43.
- [22] Karoney, M. C. (2022). *Risk Management Strategies and Performance of Commercial Banks in Kenya* (Doctoral dissertation, University of Nairobi).
- [23] Kiongo, P. M. (2023). *Influence of public participation in county annual development plan formulation in Nyandarua County, Kenya* (Doctoral dissertation, KENYATTA UNIVERSITY).
- [24] Kozłowska, J. (2018). Factors influencing shopping experience, according to the KMPG study. *Zeszyty Naukowe Polskiego Towarzystwa Ekonomicznego w Zielonej Górze*, 5(9_EN), 113-125.
- [25] Lugasi, L. A. (2022). *Project Management Practices and Quality of Housing Projects in Parklands, Nairobi County, Kenya* (Doctoral dissertation, University of Nairobi)
- [26] Mahmoud, A. S., Ahmad, M. H., Yatim, Y. M., & Dodo, Y. A. (2020). Key performance indicators (KPIS) to promote building developers safety performance in the construction industry. *Journal of Industrial Engineering and Management (JIEM)*, 13(2), 371-401.
- [27] Maina, L. G., & Mungai, A. M. W. (2023). Risk management practices and performance of infrastructural projects in nakuru county, kenya. *International Journal of Social Sciences Management and Entrepreneurship (IJSSME)*, 7(1).
- [28] Matu, J., Kyalo, D. N., Mbugua, J., & Mulwa, A. S. (2020). Stakeholder participation in project initiation: a foundation to completion of Urban road transport infrastructure projects, Kenya. *Journal of Civil, Construction and Environmental Engineering*, 5(1), 11-19.
- [29] Mares, R. (2019). Securing human rights through risk-management methods: Breakthrough or misalignment?. *Leiden Journal of International Law*, 32(3), 517-535.
- [30] Mayers, D., & Smith Jr, C. W. (1988). Ownership structure across lines of property-casualty insurance. *The Journal of Law and Economics*, 31(2), 351-378.
- [31] Naji, H. I., Zehawi, R. N., & Ali, R. H. (2018). Comparing Risks Assessment in Construction Projects using Two Program. *Journal of Engineering and Applied Sciences*, 13(16), 6730-6736.
- [32] Ndunguru, D. D., Niyonyungu, F., & Yang, X. (2020). Quantification of the Influence of Factors Causing Time and Cost Overruns in Tanzanian Construction Projects. *Open Journal of Business and Management*, 8(05), 2133.
- [33] Ndung'u, M. (2020). Determinants of urban roads projects completion in Kenya a case of inland container depot access road a in Nairobi county.
- [34] Njagi, E. W. (2018). Integration Of Indigenous And Conventional Drought Prediction And Preparedness Techniques As A Drought Risk Reduction Strategy In Mbeere North Sub-County. *Kenya (Doctoral dissertation, Kenyatta University)*.
- [35] Njuguna, P. G. (2019). Risk management practices and performance of projects in Nairobi city county, kenya. *MBA in Project management, Kenyatta University*.
- [36] Ochola, F., Lucas, S., & Nyamita, M. (2022). Effect of Risk Avoidance on Performance of Devolved Governments in Kenya. *International Journal of Finance and Accounting*, 7(4), 84-98.
- [37] Omondi, V. O., & Muchelule, Y. (2022). Project risk management on performance of kenya rural roads authority in siaya county. *International Journal of Social Sciences Management and Entrepreneurship (IJSSME)*, 6(1).
- [38] Otinga, E. J. (2022). Influence of Contractors' Experience, Obstruction of Road Construction Sites and Project Specification Changes on Completion of Road Construction Projects in Kakamega County
- [39] Pertiwi, P. P., & Margaretha, M. (2021). Localising Disability-Inclusive Disaster Response in Indonesia. In *Post-Disaster Governance in Southeast Asia: Response, Recovery, and Resilient Societies* (pp. 201-223). Singapore: Springer Singapore
- [40] Pimchangthong, D., & Boonjing, V. (2017). Effects of risk management practices on IT project success. *Management and production engineering review*, 8(1), 30-37.

- [41] Rasmont, P., Franzen, M., Lecocq, T., Harpke, A., Roberts, S. P., Biesmeijer, J. C., ... & Schweiger, O. (2020). *Climatic risk and distribution atlas of European bumblebees* (Vol. 10, pp. 1-236). Pensoft Publishers.
- [42] Shibani, A., Hasan, D., Saaifan, J., Sabboubbeh, H., Eltaip, M., Saidani, M., & Gherbal, N. (2022). Financial risk management in the construction projects. *Journal of King Saud University-Engineering Sciences*.
- [43] Simiyu, B. W. (2018). Capacity of Local Contractors and Performance of Road Projects in Nairobi City County, Kenya. *Unpublished Masters Thesis, Kenyatta University*.
- [44] Stevens-Shauger, T. (2019). Performance assessment practice as professional learning. *Interdisciplinary Journal of Problem-Based Learning*, 13(2), 2.
- [45] Steyn, H. (2002). Project management applications of the theory of constraints beyond critical chain scheduling. *International Journal of Project Management*, 20(1), 75-80.
- [46] Tripathy, V., Sharma, K. K., Sharma, K., Gupta, R., Yadav, R., Singh, G., ... & Walia, S. (2022). Monitoring and dietary risk assessment of pesticide residues in brinjal, capsicum, tomato, and cucurbits grown in Northern and Western regions of India. *Journal of Food Composition and Analysis*, 110, 104543.
- [47] Thomas, R., Kenfield, S. A., Yanagisawa, Y., & Newton, R. U. (2021). Why exercise has a crucial role in cancer prevention, risk reduction and improved outcomes. *British medical bulletin*, 139(1), 100-119.
- [48] Thuku, C. W., & Muchemi, A. (2021). Risk Transfer Strategy And The Performance Of Insurance Companies In Nyeri County, Kenya. *International Journal of Innovative Research and Advanced Studies (IJIRAS)*, 8(2), 28-33.
- [49] Ugwu, M. C., Osunsanmi, T. O., & Aigbavboa, C. O. (2019). Evaluation of risk management practice in the Nigeria construction industry.
- [50] Viswanathan, S. K., Tripathi, K. K., & Jha, K. N. (2020). Influence of risk mitigation measures on international construction project success criteria—a survey of Indian experiences. *Construction Management and Economics*, 38(3), 207-222.
- [51] Wambui, K. M. (2018). *Influence of financial management practices on the revenue collection performance of Kajiado county government*,
- [52] Wang, Y., & Wissenbach, U. (2020). Clientelism at work? A case study of Kenyan Standard Gauge Railway project. *Economic History of Developing Regions*, 34(3), 280-299.
- [53] Wang, Y., Wang, Y., Wu, X., & Li, J. (2020). Exploring the risk factors of infrastructure PPP projects for sustainable delivery: A social network perspective. *Sustainability*, 12(10), 4152.
- [54] Wathua, C. K. (2020). *Effect of regulations on growth of construction companies in Kiambu County Kenya*
- [55] Yap, J. B. H., Chow, I. N., & Shavarebi, K. (2019). Criticality of construction industry problems in developing countries: Analyzing Malaysian projects. *Journal of Management in Engineering*, 35(5), 04019020