Influence of risk reduction on the implementation of KeRRA road construction projects in Migori County, Kenya

Bundeh, Lennard William[1]
Wagude, Janet Auma[2]

[1]bundeh@rongovarsity.ac.ke
[2]jwagude@rongovarsity.ac.ke

[1,2]Rongo University, Kenya

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ABSTRACT

The implementation of Kenya Rural Roads Authority [KeRRA] road construction projects in Migori County faces significant risks, often leading to poor quality, cost overruns, and delays due to inadequate risk management. The purpose of this study was to determine the influence of risk reduction on the implementation of KeRRA road construction projects in Migori County; implementation was measured as a function of project completion within set timelines, meeting quality requirements, and being within a given budget. Guided by risk management theory, project implementation theory, and stakeholder theory, the study adopted a pragmatic research philosophy, which integrates analytic frameworks of descriptive and inferential statistics. The target population was 419 respondents, with a sample of 234; this included 39 contractors, 193 Constituency Roads Committee (CRC) members, and 2 KeRRA engineers, selected by random and purposive sampling, respectively. Data was collected with the help of a questionnaire for contractors and CRC members and a research schedule for key informant interviews with engineers. Data was analysed using both descriptive and inferential statistics with the help of the Statistical Package for Social Sciences, SPSS. The study utilized the t-statistic to test the null hypotheses. Validity and reliability of research instruments were ensured through a pilot survey and expert evaluation. The descriptive analytic framework reveals that project implementation in Migori County is below average (M=2.46, SD=1.48). The results also show that Migori County's road construction involves moderate application of risk reduction strategy (M=3.09, SD=1.20). Linear regression analysis produced results that show that risk reduction (|t| = 2.856) is a significant determinant of the implementation of KeRRA road construction projects in Migori County. In conclusion, the study revealed that implementation of the KeRRA road construction projects in Migori County is below average; it recommends formalizing a risk reduction strategy and integrating it into policy and regulation to ensure consistent application in the road projects in Migori County.

Keywords: Implementation, Kenya Rural Roads Authority, Risk Reduction, Road Construction

I. INTRODUCTION

Implementation of roads, by nature, involves many risks and instituting a risk management strategy in road construction projects is always inevitable (Silva & Ricardo, 2017). According to Tyrrel (2017) risk reduction strategy is an important discipline in project management especially in the road construction industry. A robust risk reduction strategy can help contractors to reduce their exposure to risks, and enhance the rate of success of project implementation (Tyier & Frost, 2021). Tserng et al. (2021) suggest that risk reduction strategy is the unifying element that brings consistency and course to activities and decisions in projects. Brabharan (2019) adds that risk reduction reduces the probability of occurrence of risk, further (Keller & Shrar, 2021; Howe & Richards, 2020) have defined risk reduction as the use of tried and tested advanced technology to produce more defect free products.

Additionally, Roslin (2017) describes risk reduction as an action taken to lessen the potential impact of risk factors that are considered significant threats to a road construction project. This approach is grounded in the principle that taking early action to reduce the probability or impact of a risk is more effective than attempting to fix the damage after the risk has occurred (Shubina et al., 2020). Conclusively Muchenga (2021) further notes that risk reduction is one of the key pillars of risk management strategy because if a risk is not reduced to manageable levels, project success cannot be realized.

This paper is anchored on two theories; risk management theory and theory of project implementation. KeRRA road construction projects in Kenya are faced with a myriad of problems in the course of their implementation, key amongst them being funding delays, corruption and inflation which provide fertile ground for time and cost overruns, shoddy road works and neglect. Formulating a consistent risk reduction strategy is a difficult task for any road construction firm. However, if the right strategy has been identified, making that strategy work by employing it throughout guarantees successful project implementation. However, the connection between risk reduction strategies and the implementation of road construction projects has been largely overlooked.

According to Brabhaharan (2019), risk reduction reduces the probability of occurrence of a risk or minimizes the severity of the risk within generally acceptable levels. Muchenga (2021) have defined risk reduction as the use of tried and tested advanced technology to produce more defect free products. Roslin (2017) describes risk reduction as an action taken to lessen the potential impact of risk factors that are considered significant threats to a road construction project. When it is not possible to reduce the likelihood of the risk, efforts focus on minimizing its impact by identifying the factors that contribute to the risk's severity. This approach is grounded in the principle that taking early action to reduce the probability or impact of a risk is more effective than attempting to fix the damage after the risk has occurred (Shubina et al., 2020).

Chapman (2020) in a book, *the Rules of Project Risk Management; Implementation Guidelines for Major Projects,* defines project implementation as the process of achievement of the project objectives, using the existing organizational structures and resources and management of the project by applying a collection of tools and techniques without interrupting the routine operation of the organization. According to Chai et al. (2020) implementation consists of four sub phases; the execution, monitoring, control and production. Successful completion of construction projects within the specified budget and duration is a challenging task. Abongo and Senelwa (2022) indicate that implementation refers to the way the project is rolled out, when projects are imposed on communities, the community members may be hesitant to accept them, often viewing them as having hidden agendas.

In Kenya, a PwC research in 2023 that covered 1,640 road projects in six counties in the lake region in 2020, found that the rates of implementation and completion of road projects were at 80% in Kakamega County, 70% in Kisumu County, 74% in Busia County, 71% in Kisii County, 65% in Nyamira County, 49% in Homabay County and 43% in Migori County in terms of implementation. In terms of completion, only three counties completed their projects 100% on time and within budget. In this category Kakamega County again led with 100% success rate while Migori County came last with 49%. The rest of the counties either failed to meet the objectives and/or scope or did not meet the deadlines and budget. In a similar study, Klynveld Peat Marwick Goerdele [KPMG] carried out an analysis of road infrastructure in Migori County and the neighbouring Kisii County in 2021. Both Kenya Urban Roads Authority [KURA] and Kenya Rural Roads Authority [KeRRA] roads were included in the study. According to the study report, approximately 75% of KeRRA roads in Migori County had suffered at least one project implementation failure within the year of study. In Kisii County, KURA road projects implemented had posted 98% completion rate (KPMG, 2022). So, the question is, why do the KeRRA road projects fail? Studies conducted on critical success factors of project management suggested that risk reduction strategy is an important part of project implementation success (Fan et al., 2020; Fapohunda & Stephenson, 2020; Dwevedula et al., 2019).

1.1 Statement of the Problem

Klynveld Peat Marwick Goerdeler (KPMG) research consultants carried out an analysis of road infrastructure in Migori County and the neighbouring Kisii County in 2021. Both KURA and KeRRA roads were included in the study. According to the study report, approximately 75% of KeRRA roads in Migori County had not been completed. Moreover, 70% of KURA roads also stalled. On the other hand, the study reported that 80% of KeRRA roads in Kissii County were completed and KURA road projects implemented had posted 98% completion rate. Implementation of selected roads in the devolved unit of Migori is below average (KPMG, 2021). Road networks in the County is made up of 1,928 kilometres out of which 25% is gravel and 75% is earth, out of this, it is estimated that 69.9 % have not been successfully implemented both in terms of quality, meeting set budget and completion timelines. Observations in Machakos County show that when risk reduction was put in place by the county government, the rate of KeRRA project implementation recorded a growth of 71.8% and that few road construction projects fell behind implementation schedule. Studies on risk management strategies done in other countries indicate that several models have been developed in recent years, but the majority of these models have produced differing results. It is against this backdrop that the current study wishes to establish the influence of risk reduction on implementation of KeRRA road construction projects in Migori County, Kenya.

1.2 Research Objective

To determine the influence of risk reduction on implementation of KeRRA road construction projects in Migori County;

1.3 Research Hypotheses

Risk reduction has no significant influence on implementation of KeRRA road construction projects in Migori County.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Risk Management Theory

In this study, risk management theory is the overall theory, this is because it sums up the explanation of the rationale behind organisations putting in place the right level of controls for all uncertainties a project may encounter (Kirira et al., 2020). It suggests that risk arises from the dynamic changes in the economic environment and is influenced by both external factors such as the economy, competitors, and project implementation dynamics and the internal decisions made by an organization.

This approach was initially recommended in 1738 by Daniel Bernoulli, resulting in the decision making process where individuals had to pay more attention to the magnitude of the effects of different project outcomes. Mathematical justification of the risk management theory was entrenched by Markowitz in 1971. -Effective risk management can enhance organizational value and improve decision making by proactively identifying, assessing, and mitigating potential risks. Effective risk management reduces the likelihood of financial losses due to unforeseen events, such as market volatility, operational failures and legal issues (Ajupov et al., 2018). Risk management strategies help the contractors and project management committee to mitigate the risks hence enhancing the implementation of road projects. According to studies by El-Sayegh and Mansour (2019); Osman and Kimutai's (2020) risk management theory is limited in explaining the implementation of risk controls that may involve externally triggered changes to operations, orders, standard operating procedures, and external stakeholders. Therefore, in this study, it is complemented by project implementation theory. However, the theory is effective in addressing static risks that are not influenced by the competitive environment but instead rely on internal factors within the organization. The outcomes of risk management strategies are evident in the successful implementation of rural road construction projects, which is the primary focus of this study.

2.1.2 Theory of Project Implementation

This study was also guided by the theory of Project Implementation developed by Fugate and Knapp (1996). Assaf and Al-Heijji (2019) in application of this theory, suggested that road project contractors use the project implementation theory to facilitate planned changes within organizations by creating environments where successful project execution can take root. Kaliba et al. (2020) describe implementation as a sequence of actions taken by responsible organizational agents to plan and manage the change process, ensuring the successful achievement of project objectives. Fugate and Knapp (1996) argued that excessive reliance on theoretical concepts is the key factor that distinguishes a profession from a craft. Since this theory in its focus examines how policy or projects are implemented from planning, execution and all the way to closure, it is relevant as it offers a lens to study how risk management practices affect the success of implementation strategies in road projects. It is thus applied here to analyze implementation as a process influenced by actors, risks and field realities. The theory hypotheses that effective planning is positively associated with successful project implementation. The rationale is that project implementation theory asserts that detailed and realistic planning enhances likelihood of delivering on time, within budget and quality standards.

This theory is relevant for the current study because it covers fundamental issues surrounding road project implementation especially management of risks and uncertainties which is lined up for empirical analysis in this study. Nima and Keyvan (2020) argue that successfully implementing a project is often challenging and complex, and the procedural steps involved are difficult to define since project implementation is a universal process. According to project implementation theory, the project manager must invest considerable time and effort in managing both human and technical factors, as these are crucial to the successful implementation of a project. Additionally, it is suggested that various determinants can influence project implementation success if not carefully managed. Such determinant factors include risk management strategies put in place and stakeholder participation (Fapohunda & Stephenson, 2020). This necessitates the need for incorporation of the stakeholder theory.

2.2 Empirical Review

2.2.1 Risk Reduction and Implementation of Road Construction Projects

Ramanathan et al. (2018) defines risk reduction as simply "risk mitigation" designed to minimize the impact of a risk to an acceptable threshold. Landage (2016) defines it as taking early action to lower the probability and potential impact of a risk. These definitions agree that risk reduction is a measure instituted to minimize or lessen to manageable levels, the impact of a probable risk. However, the two definitions are too general and may be applicable to varied areas of study. In view of the above the definition adopted for the current study is derived from Sifumba et al. (2020), risk reduction are steps taken to minimize the potential impact of those risk factors deemed sufficiently threatening to a

project. This definition is considered appropriate since it incorporates the aspect of project risks which fits well with the current study which intends to study risk management strategies in road construction projects.

In Malaysia, Kang et al. (2015) conducted a study on the current practices of risk management in the construction industry. They found that the theory behind risk management is often misunderstood due to its complexity, making it essential to clearly define the available techniques for responding to specific risks. The study identified three approaches for addressing risks: risk transfer, risk analysis, and risk acceptance. According to the study, risk transfer, lessens the impact of the risk event and may include not undertaking an activity which may carry risk. Further, the study suggests that risk analysis, is the analysis of probability and consequences, and that, the potential impact of these risks factors are determined by how likely they are to occur and the effect they would have on the project if they did occur; however, these results are bound to have major weaknesses as the research did not include a major component of risk management strategy that is risk reduction. Roya et al. (2022) posits that risk reduction is a very key cog in the wheel of risk management strategies. Langeroodi et al. (2011) sought to assess the influence of risk reduction practice on performance of construction projects and adopted a mixed research design which included descriptive survey, and correlation. The target population was 1761 with a sample size of 326 respondents obtained by stratification and purposive sampling techniques. However, the study was too general in the aspect of risk reduction and failed to specify the level of risk reduction based on the standard phases of the project life. The current study therefore intend to assess the influence of risk reduction at every phase of the project life starting from project identification and also concentrate on implementation of road infrastructure projects only.

Teshome (2021) conducted a study in Ethiopia, where he analyzed and evaluated various risk drivers in highway construction projects in Oromia. Using a probability/impact questionnaire survey, he identified 31 significant risk drivers, which were grouped into five categories: project scope, right of way, utility conflicts, architectural/engineering (A/E) services, and risk reduction. Risk reduction drivers from previous studies were selected, analyzed, and assessed for the research. The study found that 80% of respondents considered risk reduction essential for highway construction projects. Watema and Tulirinya (2021) studied project implementation, risk management and project success in Uganda as a part of the feasibility of project investment by using a questionnaire with 49 risk factor included into 8 aspects. The study identified several key aspects: marketing, technical and technological, political, regulatory and risk management policy, social and cultural, environmental and city planning, as well as financial and economic factors. A risk probability matrix was used to check on the risk management policy, followed by financial analysis for the feasibility study and sensitivity analysis. The findings showed that failure to incorporate risk reduction factors in the feasibility study led to a decrease in investment feasibility parameters.These findings found evidence that there is a correlation between risk reduction and project implementation success, however, it is not clear if the risk probability matrix used to check on the risk management policy is appropriate, this may compromise the final outcome and might not yield conclusive results. The current study purposively sampled Consultant Engineers in the road construction sector to solicit expert views on the variables under investigation to come out with clear results.

Njeri (2020) noted that the construction sector is one of the key economic sectors and is the main force motivating the Kenya national economy. Upon the establishment of the Kenya Rural Road Authority (KeRRA), Kenya Urban Roads Authority (KURA), Kenya National Highway Authority (KeNHA) and The National Construction Authority (NCA), and the assumption of their power over implementation of road construction projects and general construction of other structures, the road construction sector in particular has witnessed noticeable expansion and activities, so has the challenges also become twofold (Simiyu, 2020). Nakitare (2020) emphasizes that a well-maintained and efficient road network is essential for economic growth, poverty alleviation, and the creation of wealth and employment. The Ministry of Roads plays a crucial role in achieving the goals outlined in Kenya's Vision 2030, the Millennium Development Goals (MDGs), and the Economic Recovery Strategy for Wealth and Employment Creation (ERS). This is accomplished through the development, maintenance, rehabilitation, and management of the country's road infrastructure (African Development Bank, 2020).

According to the Kenya Roads Board (2021), infrastructure development has been prioritized to ensure the successful implementation of key road projects under the "economic pillar." the implementation rate of roads in Kenya is generally below 50%. Improving roads to a motorable condition is essential, as road transport accounts for approximately 80% of cargo and passenger movement in the country. Recognizing the critical role of roads in the nation's socio-economic development, the government has recently increased budget allocations to the road sub-sector and promoted the adoption of appropriate risk reduction strategies (Chepkemoi, 2021). These researchers underscore the crucial role of risk reduction in project implementation however they have failed to specify clearly as to whether the risk reduction should be a continuous process in the life cycle of a project or if it should be a one off event and if it should be the only strategy to be instituted or to be done in conjunction with other risk management strategies. As a result of these shortcomings, there is need to study risk reduction in view of other strategies and implementation of road projects with a view to sharing knowledge, skills and experiences to enable successful implementation process.

Hove and Banjo (2018) conducted a study on the impact of risk management strategies on project implementation, focusing on selected international development organizations in Nairobi, Kenya. The research employed a quantitative correlational or predictive design to explore the relationship between identified research variables and the dependent variable. The findings revealed that the risk reduction strategy was statistically significant, demonstrating a strong correlation with techniques such as taking no action on perceived risks and establishing contingency plans. According to Tyrrel (2017) both stratified sampling technique and correlational or predictive design are inefficient in selection of a heterogeneous population which is dispersed within a large geographical location; the present study therefore infused the use of purposive technique which focuses on the targeted respondents for accurate data. Nakitare (2020) while conducting a survey based on the status of the NGCDF funded road projects in Kwanza constituency warned that the noble objectives of the devolved funds would be hard to achieve if road projects were being implemented in total disregard of the fundamental principle of risk reduction strategy as most of the roads done would continue to develop potholes, culverts and bridges crumbled within a space of six months of project handover. This view is vindicated when in a recent review of road construction projects in Machakos County was revealed that when risk management plan was put in place by the County Government, few road construction projects fell behind schedule. According to the County Integrated Development Plan [CIDP] (2020) report these findings reflects the scenario prevailing in Migori County because despite so many road infrastructure projects having been initiated so as to transform the transport sector and accessibility for the people in Migori County, little have been achieved as the reviewed literature also reveals. It is against this background that this study sought to establish the relationship between risk reduction and implementation of KeRRA road construction projects in Migori County, Kenya.

III. METHODOLOGY

3.1 Study Area

Migori County is one of the 47 counties that make up the Republic of Kenya. It has eight sub-counties namely Awendo, Rongo, Uriri, Suna East, Suna West, Nyatike, Kuria West and Kuria East. It borders Kisii South and Gucha South Sub-Counties to the east, Trans Mara Sub-County to the South East, Uriri Sub-County to the South and Ndhiwa Sub-County to the West. It rises between 1260 – 1800 metres above sea level. It is found 0.52^0 South of the Equator and 34.21^0 East of the Greenwich Meridian (Macmillan, 2005).

Social and cultural systems contribute significantly to the process of development in the county. They are dynamic human functional components and they tend to portray the underlying problems and opportunities for development (Ambwere, 2019), likewise, the population of Migori County is predominantly rural with almost the entire population being Luo, though Kuria East and West sub-counties are inhabited by the Abakuria tribe are there is a small population of Maragoli (a Luhyia sub tribe) who have bought land and settled to the south near Uriri Sub-County border. The existing socio-economic system in the study area shows a homogenous society with almost similar cultural values. The population almost entirely depend on agriculture and trade hence the need for proper roads.

3.2 Research Design

A research design is the plan or the overall strategy for conducting a research (Segal, 2017). Based on the pragmatism philosophical foundation of this study and the diversity of the target population, a concurrent triangulation design is adopted. Concurrent triangulation method is where the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this design, the investigator collects both forms of data at the same time and then integrates the information in the interpretation of the overall results. Triangulation of data is where data are collected through multiple sources to include interviews, observations and document analysis; thereafter, results from qualitative data are merged into the text to reinforce the results from quantitative data (Creswell & Creswell, 2023). This can be diagrammatically represented as shown in Figure 1.

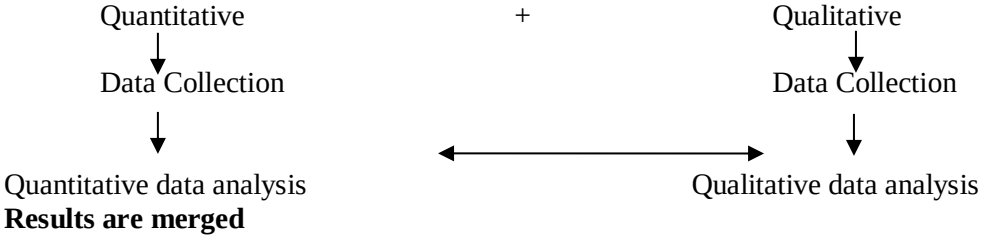

Figure 1
Concurrent Triangulation
Source: Creswell & Creswell (2023)

Data for this study were collected through use of a questionnaire and an interview schedule. These two data sets are then analysed and compared to determine convergence or divergence between the independent and dependent variables and also the moderating role of stakeholder participation on the influence of risk management strategies and implementation of KeRRA road construction projects in Migori County. The results are then merged into the text.

3.3 Target Population

The population for this study comprised of Contractors and Constituency Roads Committee Members (CRC). The target population for this study was 419. Out of this 43 comprised of 34 road contractors and 9 sub-contractors whose construction firms are listed in the Department of Roads, Transport and Public Works register as having been awarded contracts between 2019 and 2023 in Migori County. Also targeted were sub county roads committee members who normally carry out monitoring of roads projects. There are eleven members per project hence, the 34 projects give a total of 374 respondents. Two Consultant Engineers, who are KeRRA employees in the County, were key informants for the study; therefore, the accessible target population for the study was 419. Most of the road projects targeted for the study take between 1 to 5 years to complete hence, the choice of the 5 year period maximum (Government of Kenya [GoK], 2020). According to information obtained from County Public Works Offices in Migori and confirmed from available reports, a total of 67 road contractors were prequalified and registered to perform road works in the county, though only 43 have been awarded contracts within the specified period, 34 of them to work on roads as main contractors and 9 as sub-contractors (CIDP, 2020).

Table 1

Target Population

No	Target category	Number	Total
1	Road contractors (companies)	34 Contractors and 9 Subcontractors	43
2	Sub County Roads Committee	34 projects * 11 members of CRC members	374
3	Consultant Engineers	2 engineers for the County	2
	Total		**419**

Source: *Migori County Public Works Office (*2022)

3.4 Sample Size and Sampling Procedures

Yesemin and Dan (2018) explain that sampling is the process of selecting individuals from the target population to act as representatives in a research study. Considering the population of CRC and contractors is high, a sample was selected from the target population; however, consultant engineers were purposively selected to participate in the study. The study employed Yamane (2018) formula for sample size determination. The sample size was calculated based on 5% margin of error/ level of precision and 95% level of confidence. The formula is as follows:

$$n = \frac{N}{1 + N(e^2)}$$

Where,

n is the desired sample size

N is the finite population

e is the margin error/ level of precision taken as 0.05

The breakdown of the sample size per contractors and members of CRC based on their proportion in the population is provided in Table 2 below.

Table 2

Sample Size

No	Target category	Target	Sample size
1	Road Contractors (companies)	43	39
2	Sub County Roads Committee members	374	193
3	Consultant Engineers	2	2
	Total		**234**

Source: *Migori County Public Works Office* (2022)

The respondents were sampled as follows; 39 road contractors, 193 Sub County Road Committee members and 2 Consultant Engineers.

3.4.1 Sampling Procedures

In selecting respondents for the investigation, probability and non-probability sampling methods were used. Simple random sampling method was applied in selecting Constituency Roads Committee members and KeRRA road

contractors. This sampling technique allows each object or element in the sample frame to have an equal chance of being selected based on the proportion of their number in the target population. This design involved identifying a suitable sample frame, deciding on a suitable sample size, choosing the most appropriate sampling method and ensuring that the sample represents the whole population under investigation.

With reference to Table 2, each category was selected. In order to select 39 out of 43 contractors, simple random sampling method was applied to select the respondents through use of lottery technique. This involved writing the contractors codes in sheets of paper (43) and thoroughly mixing the codes after which only 39 selections were made as representatives of the whole population. The procedure was repeated for CRC members. The advantage of this method is that it allows the researcher to obtain a sample that best represents the entire population under study (Lincoln et al., 2017). This method ensures that each respondent has equal chance of being selected based on the proportion of their representation in the target population. On the part of KeRRA officials, purposive sampling method was used in their selection to collect information from them with regard to how they ensure that set standards of road construction are followed and implemented by all stakeholders involved in KeRRA road construction projects.

3.5 Data Collection Tools and Procedures

The study used primary data. Primary data are the first-hand information collected by the researcher (Alexander & Dmitry, 2017). This study adopted primary data because of the advantages that accrue from their use; primary data give reliable first-hand information (Segal, 2017).

3.5.1 Data Collection Procedures

A research approval letter was obtained from the Directorate of Graduate Studies of Rongo University. This letter was forwarded to the National Commission for Science, Technology and Innovation (NACOSTI) which granted the research authorisation and permit. Primary data were collected using a structured questionnaire and an interview schedule to solicit information on risk reduction on implementation of KeRRA road construction projects in Migori County. For primary data, a questionnaire was used because it is easy to administer and the respondents filled the required data even in the absence of the researcher. Tserng et al. (2021) suggest that it is appropriate to collect data from samples using structured questionnaires.

The interview schedule for Consultant Engineers was semi structured and contained information related to the study objectives. The advantage of using an interview schedule is to get in-depth information that helps to enrich and complement information received from the questionnaire. In the administration of the questionnaire to constituency roads committee members and contractors, each respondent received a questionnaire, and a copy of the research authorization letter. For the interview, the consent letter was read to them in order for them to provide permission for interview. The respondents were expected to voluntarily provide information and confidentiality of the information provided was guaranteed.

3.6 Data Analysis and Presentation

Presentation and analysis of data began with editing, coding and cleaning of data. Coding and analysis of data were assisted by a computer software, the ‘Statistical Package for Social Scientists (SPSS), version 25.0’.

3.6.1 Descriptive Analysis

Descriptive statistics of ‘mean’, ‘Percentage’ and ‘standard deviation’ are used to establish the general direction and spread of the respondents’ perceptions about each variable.

3.6.2 Inferential Analysis

Inferential statistical analysis in this study is based on a multiple linear regression model specified in equations (3.2) and (3.3). The objective of this analysis is to establish the specific form and strength of the relationship between implementation of road construction projects in Migori County, on the one hand, and risk management strategies as well as stakeholder participation, on the other hand.

The model examines the simultaneous influence of four risk management strategies (risk acceptance, risk transfer, risk reduction and risk avoidance) on the dependent variable, as in equation (3.2); and the simultaneous influence of these four risk management strategies on the dependent variable when stakeholder participation is introduced as a moderating variable, as in equation (3.3).

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Implementation of KeRRA Road Construction Projects in Migori County

The dependent variable of the study is the implementation of road construction projects financed by KeRRA in Migori County. The respondents were asked to state the degree to which different aspects of projects were implemented with statements measured on a Likert scale of five. The descriptive results are provided in Table 3.

Table 3

Implementation of KeRRA Road Construction Projects in Migori County

Items	SD	D	N	A	SA	Mean %	Std. Dev.
The project is implemented according to the set budget.	39	53	1	42	94	3.43 68.6%	1.60
Project is implemented according to the details in the bill of quantities.	50	99	2	38	40	2.65 53%	1.43
The road construction is being implemented according to the planned timelines.	42	122	7	15	39	2.49 49.8%	1.33
Project supervisors have a way of ensuring that the project is always on track.	37	57	5	89	41	3.18 63.6%	1.41
The road project being implemented meets value for money returns for on road and off-road users.	119	53	5	10	42	2.14 42.8%	1.54
The project is being implemented according to the quality specifications in the road contract.	132	41	2	7	47	2.11 42.2%	1.60
Composite score						2.46 49.2%	1.49

Key: SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree and SA-Strongly Agree.

Statistics in Table 3 indicate that respondents are above average (M=3.43, 68.6%, SD=1.60) on the statement that road projects are implemented based on set budgets. It suggests that a significant number of respondents appear to agree that the road projects are done according to the set budgets, a substantial number also disagrees (31.4%). This implies that there is constant variation in road projects costs since the budget approved at the tender award stage is changed until the project is finished. This could explain the delays in completion of KeRRA road construction projects and escalation of their costs. Key Informant number two stated that the issue of cost is mainly influenced by shift in government priorities and changes in the availability of funds which affect money availability for project execution. According to the other key informant, road projects in Migori County often rely on national government budgets and at times on external funding. Such sources of funding can be unpredictable, at times leading to delays, scope reduction and compromised quality.

Secondly, respondents appear to disagree (M=2.65, 53%, SD=1.43) on the question of construction projects by KeRRA being done according to the details in bills of quantities. Whereas it is the expectation that all projects are properly designed and details included in the bill of quantities before it is awarded to the contractor, a significant number of respondents felt that this is not the case as some project details are changed from the original bill of quantities which could affect the final outcome of the project once completed. This information was supported by Key Informant number two who stated the following:

> *"Sometimes the road is completed within the specified timelines; however, contract documents are doctored by county officials so as to downgrade the specifics in road while the contract sum is maintained. This is the latest method being used to siphon money from counties. This gives a raw deal to the road users."*

It is, therefore, clear that details on a project contract are at times changed by the officials in charge of supervision, which results to construction of sub-standard road networks. Most respondents appear to disagree (M=2.49, 49.8%, SD=1.33) that KeRRA road construction projects are being implemented according to the planned timelines. This means that the issue of delays is a common feature associated with KeRRA road projects in Migori County. To get a clear picture of this situation, key informant number one stated that time overrun was factored in through establishing deadlines according to phases by contractors. Nevertheless, these time overruns' cost burden is often borne by the taxpayer.

The study results indicate that sometimes (*M*=3.18, 63.6%, *SD*=1.40) project supervisors, that is KeRRA engineers have a way of ensuring that a project is always on track (supervision and monitoring). This means that there are times when KeRRA engineers are unavailable to inspect ongoing road construction activities which jeopardizes project quality considering some contractors do not follow the required guidelines during construction. Most respondents disagree (*M*=2.14, 42.8%, *SD*=1.53) that road projects being implemented by KeRRA in different areas of Migori County meet the value for money invested for on-road and off-road users mainly motor vehicles and pedestrians. This suggests that most projects constructed through KeRRA in the county are not to the level of expectation of the end users. Some of them do not have markings, others do not have proper drainage systems, thus resulting to clogging of culverts and bridges while others have no pavements and walkways for pedestrians.

Further, the respondents seem to disagree (*M*=2.46, 49.2%, *SD*=1.48) with the assertion that KeRRA road projects being implemented in Migori County are done based on the quality specification in the road contracts. This means that low quality roads are constructed because the contractors appear to be the ones left to implement the projects as KeRRA personnel appear not to be keen on details. Composite values show that the mean values were 2.46 (49.2%), with a standard deviation of 1.48, which suggest that respondents neither agree nor disagree fully on the level of implementation. It can be concluded that the performance of KeRRA road project implementation is at below average level in Migori County.

4.1.2 Risk Reduction in KeRRA Road Construction Projects in Migori County

The study sought to establish the level of risk reduction in KeRRA road construction projects in Migori County. The findings were presented in Table 4.

Table 4

Risk Reduction in KeRRA Road Construction Projects in Migori County

Statements	N	Mean	Std. Dev.
Risks are identified early at the planning stages of the road construction project	229	1.6332	1.24814
There is provision for adequate analysis of identified risks and their management measures to reduce cost overruns	229	2.0437	1.26969
We make efforts of ensuring that financial risks associated with payment delays are properly identified and addressed before project start	229	2.7293	1.23049
There are remedial risk management approaches put in place to manage risks that are expected during project execution	229	3.0349	1.25607
Site conditions are assessed and remedial risk plan prepared early before commencement of the road project	229	2.2882	1.44334
We ensure that all stakeholders involved in the road project adhere to technical plan for the project remedial risk management measures	229	3.8210	1.38548
We supervise road projects to ensure that the materials supplied and used in the road project are of good quality	229	4.1441	1.10073
There is regular supervision to ensure that the road project is implemented to the standard with minimal variation from set quality specification	229	4.0524	.94445
We ensure that there is effective supervision of project personnel to reduce risks associated with time overruns	229	4.0917	.92971
Valid N (Listwise)	229	3.0932	1.2009

In table 4 respondents disagree (*M*=1.63, *SD*=1.24) that risks are identified at early stages of KeRRA road construction projects. However, this finding was disapproved by Key Informant number one who stated that they do identify risks early: ‘risk reduction by early identification of expect risks at the planning stage of the project’. The result also could mean that identification of risks is undertaken by the KeRRA engineers and project contractors only with little input from the project beneficiaries. Results also showed that respondents disagree (*M*=2.04, *SD*=1.26) that there is provision for adequate analysis of identified risks and their management measures to reduce cost overruns. This implies that since risks are not identified earlier, existence of risk analysis does not occur and therefore incidents of cost overruns could be experienced during road construction processes.

However, respondents are undecided (*M*=2.72, *SD*=1.23) that at times they do not make attempts of ensuring that financial risks related to payment delays are well identified and tackled before the project begins. The results suggests that not all efforts are made to make sure that financial risks related to payment delays are identified and addressed. Results also indicate that respondents are undecided (*M*=3.03, *SD*=1.25) on the statement that remedial risk management techniques are put in place to manage risks which are expected during road construction.

The statistics also reveal that respondents disagree (*M*=2.28, *SD*=1.44) that road project site conditions are assessed and remedial risk plan prepared early before the projects start. Where there is no prior assessment of areas

where KeRRA road projects is to be undertaken, the implementing team encounters various risks during execution resulting to stalled projects, abandonment, increased costs and sub-standard roads in Migori County. Positively, respondents agree with the statement (*M*=3.82, *SD*=1.38) that stakeholders in the roads project make sure that all contractors and sub-contractors adhere to the technical plan for the project remedial risk management measures. This action is done to reduce impact of risks and that is why it is necessary that all stakeholders are informed in advance.

In risks reduction process through supervision, statistics show that most respondents agree (*M*=4.14, *SD*=1.10) that they regularly supervise road projects to make sure that materials being supplied for road construction are of good quality. Sub-standard materials reduce the quality of roads, which brings losses to the government. Further, respondents appear to agree (*M*=4.05, *SD*=0.94).

Lastly, the respondents agree (*M*=4.09, *SD*=0.92) that they ensure there is effective supervision of contractors involved in the road projects to reduce risks related to time overruns. Composite statistics show that respondents are neutral on the risk reduction strategies in the implementation of KeRRA road construction projects (*M*=3.0932, *SD*=1.20009). This implies that some risk reduction strategies are applied and followed in detail while others are not given much attention. This could explain why some road projects are performing well while others are still not yet complete in Migori County.

Table 5

Summary of Hypothesis Testing

	Null Hypotheses	**Beta**	**|t|-statistic**	**p-value**	**Decision**
H_{01}:	Risk reduction has no significant influence on implementation of KeRRA road construction projects in Migori County	.156	2.974	.003	Rejected

4.2 Discussion

4.2.1 Risk Reduction and Implementation of KeRRA Road Construction Projects

Composite data in this study showed that risk reduction strategies were implemented at moderate level (M=3.09, SD =1.20). The regression statistics show that there is a significant relationship (β=0.156, |t| =2.974, p=0.003) between risk reduction measures and implementation of KeRRA road construction projects in Migori County, leading to the rejection ($|t| > |t_{05}|$) of the null hypothesis (H_{01}). It can be concluded that risk reduction measures present in the study area do enhance implementation of KeRRA road construction projects.

The study findings are in conformity with Al-Ajmi and Makinde (2018) observation that many road contractors practice formal risk management systems with analytical approaches, such as risk reduction, in mitigating risks. Renault et al. (2017) identified lack of expertise and indifference by managers as significant hindrances to adoption of risk management strategies in projects.

Findings by Carr and Tah (2020) in a study of fuzzy approach to construction project risk assessment and analysis in South Africa are also in agreement with the results of this study. The study further confirms findings by Rehacek (2018) which established that road contractors applying regular use of risk management strategies find it important to understand and employ formal process of risk reduction in major projects. Diversity in parties' perceptions in a construction project invites undesirable biases in decision making, which make the process of risk reduction as a risk management method in road construction projects more appropriate (Naji & Ali, 2018). This lends credence to the views of El-Sayegh and Mansour (2019) which posit that risk management theory is adequate in explaining use of risk reduction that can involve externally triggered changes to operations, orders and standing operating procedures in road construction projects.

The current study findings also support the argument of Mukamwezi (2022) in a study in Rwanda that as part of risk reduction, several techniques are used in road infrastructure projects; having contingency plans, use of work plans in project implementation, utilisation of regular inspection and implementation of safety systems to ensure successful implementation of road construction projects. The study found out that risk reduction is a significant determinant and that early infusion of risk reduction during project planning phase had a significant positive effect on road construction project performance.

Other scholars (Jaskowski and Biruk, 2019; Rwelamila, 2018; Firmenich, 2020) also hold contrasting views. In a recent research within the context of developing economies their study indicated that lack of experience, inadequate information, and awareness of risk management processes are the most significant challenges which negatively affect successful implementation of road construction projects in most African countries, even though the sector is emerging as a crucial cog in the wheel of development in recent times. Similarly, Omer and Adeleke (2020) in another study discovered that low level of familiarity with techniques and the inability to recognize the benefits of the process of risk application were the most influential factors which impact the adoption of risk management strategies by most contractors and not solely the technicalities of risk reduction. In another contradictory study, Teuma (2018) observed

that on the one hand; due to the manpower size of most road construction projects, they mostly suffer from inadequacy of facilities to provide adequate training in risk mitigation methods. Those trained, on the other hand, are incapacitated by lack of funds and obsolete technology in the road construction industry.

A study conducted within the lake region of Kenya by Ochenge (2020) on effects of project management practices on implementation of road infrastructure projects done by local firms observed that efficient implementation of road infrastructure projects is essential for economic growth and development. However, implementation of road infrastructure projects in the Lake Basin region constructed by local firms is poor in terms of completion within the budgeted cost, time schedule and attaining the desired quality. All in all, the study concluded that risk reduction has no significant influence on implementation of road infrastructure projects by local firms in the Lake Basin region in Kenya. Further, Sule (2021) in a study of road construction projects in Kisumu East Sub County holds the view that there is more to successful project outcome than just focusing on the triple dimensions; time, cost, and quality and tying them to risk reduction and the attendant risk mitigation strategies as an aspect of risk management strategy.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Thirdly, the study established that risk reduction strategies are implemented at an average level in KeRRA construction projects in Migori County (M=3.93). It was found out that CRC members regularly supervised roads projects to make sure materials supplied are of good quality hence reduce risks associated with substandard materials supply. The supervision was not only on materials but also on project personnel to ensure incidents of time wastage were greatly minimised. The study also discovered that CRC members made efforts to ensure that the technical specifications of the roads projects plan were adhered in totality. Risk reduction was also accomplished by ensuring that remedial risk management approaches were already put in place to manage risks in case they happened when implementing of roads projects. The third null hypothesis is rejected ($|t| = 2.856$) resulting to the deduction that risk reduction measures have significant influence on implementation of KeRRA road construction projects in Migori county. Efforts to reduce risks seemed not to spur increased level of implementation of road construction projects in the study area.

5.2 Recommendations

In order to institutionalise risk management in KeRRA road construction projects, it is the recommendation of this study that authorities mandate the inclusion of comprehensive risk management plans in all phases of road construction planning, design, implementation and project closure. Since risk management positively influences road project implementation, formalizing it and integrating into policy and regulation would ensure consistent application in KeRRA road projects.

As a way of ensuring risk management strategies are properly undertaken, there is need for activation of a system of risk reporting and remedial actions placed in order to ensure smooth and effective road project implementation process. All tender documents need to clearly specify the risks (including time and finances) that should be borne by different actors in the road construction projects including KeRRA, contractors, sub-contractors, other government agencies and utility service providers, in order to save taxpayers' money.

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