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Effect of Risk Identification and Risk Analysis on Performance of Road Construction Projects in Kenya: A Case Study of Kakamega County

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Abstract: **Risk management practices are the processes of identifying, understanding and determining the potential unsatisfactory outcomes likely to affect a project. Risk management practices positively influences project performance by instrumental effects through creation of a contingency plan or by influencing project time, budget or design plan. The main aim of this study was to investigate the effect of risk management practices on road construction projects performance in Kenya. The specific objectives of the study were to find out the effect of risk identification and risk analysis on project performance. The instrument of data collection were structured questionnaires. The target population consisted of 80 project managers, road engineers, project managers, road supervisors, road inspectors, road surveyors and contractors in Kakamega County. The unit of analysis were ongoing and completed road projects implemented by Kakamega county government. Simple random sampling used to select 80 of whom 70 respondents returned the questionnaires representing 87% respondents. The findings showed that risk identification has a positive and significant effect on risk management practices in road construction projects. Risk analysis has positive and significant effect on the risk management practices in road construction projects. There were gaps that were identified that would result in the curtailing of these positives. Issues related to the involvement of the project team during risk identification stage were brought up. In conclusion, risk identification and risk analysis factors affect risk management practices on performance of road construction project**

Keywords: **Project Risk, Risk management practices, Risk identification, Risk analysis, Uncertainty**

1. INTRODUCTION

A study by [9] defines risk as contact to loss/gain, or the likelihood of occurrence of loss/gain increased by its respective degree. An uncertain event or state that, if it occurs, has a positive or negative effect on a project's objectives is defined as a risk [13]. According to [8] it is important to include the management of opportunities in any risk management process. Risk often varies in the probability of its manifestation and its impacts from one project to another and risk variations its nature during the project life cycle. An absence of project information, mostly in the early stage of a construction project, always leads to a advanced degree of risk associated with cost, time and quality. Risk level however, may decrease with the project.

According to [4], Risk management process (RMP) is a concept that has been widely used within the field of Risk Management. The process consists of four main stages: identification, assessment, taking action and monitoring the risks. There are a number of methods and techniques which enable management of risks in each of these steps. Numerous industries have become more active and aware of using analyses in projects. Likewise, RM has become a timely issue widely discussed across industries. However, with relation to the construction industry, risk management is not commonly used [10]. Additionally, risk management in the construction project management framework is an all-inclusive and systematic way of identifying, analysing and responding to risks so that the objectives of the project are achieved. Using

risk management from the early stages of a project, where major decisions such as choice of alignment and selection of construction methods can be influenced, is essential [6]. The benefits of the risk management process include identifying and analysing risks, and improvement of construction project management processes and effective use of resources.

2. EMPIRICAL REVIEW

[7] studied thirty two factors influencing construction projects in Uganda and placed delay in honouring certificate first. In their conclusion the finance factors were found to be the most influencing factors causing project delays. In this study consultant ranked poor design highest, client ranked underestimation of construction cost highest and contractors ranked lack of skills highest [7]. [12], In their article; The Management of Agricultural Risk in Bangladesh, found out that risks have been broadly organized into five categories, these are Production, Financial, Marketing, Institutional and personal factors.

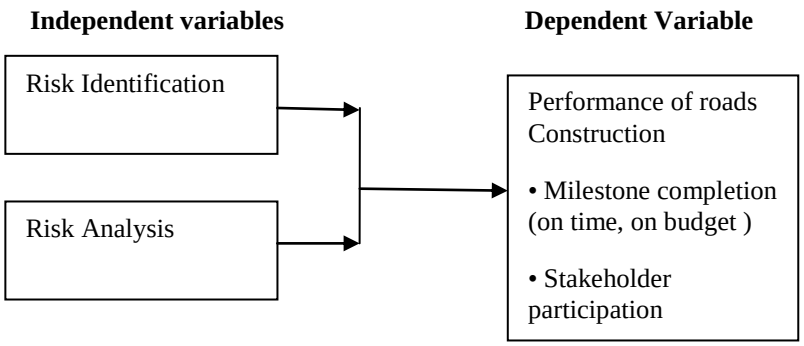
[11] indicated that various risks affecting time and schedule overrun in the construction industry specifically in the road projects in Palestine are, financial status of the contractors that they might have not clearly indicated in the bidding process, payment delays by the owner which affects the entire project schedule which may force the project team to enforce heavy fines, the political situation of the country which is highly unforeseeable, poor communication between construction parties which can be avoided through proper communication plans in the project, lack of equipment efficiency and high competition in bids.

According to [14], the most common factors that cause the construction delays in Pakistan are external factors that cannot be controlled due to their nature of occurrence which is a natural disaster such as earthquake and floods. These extreme factors are had to control and there is nothing that the project team can do to mitigate them when they occur. Similarly, [2] found that unexpected problems such as acts of natural phenomenon which are beyond human control also causes the project delays hence leading to most stalled or terminated projects. Other factors causing delays in Pakistan are financial payment issues which are caused be delay in disbursement of funds by the project sponsor, poor planning by the project team that is involved directly in the project, poor site management by the resident engineers and the supervisors, lack of experience in the project professionals and lack of adequate materials and specific equipment which affect the expected performance of the project in terms of milestones to be achieved.

In Singapore, [11] found that from the field survey which included 40 consultants, the main factors affecting project success from the consultants view are materials price fluctuation which cannot be controlled but project team, size of contract which could be mitigated at the initiation phase and also incomplete drawings from the professionals involved which leads to schedule delays.

According to [1], the members of the project who participate during the implementation of projects face challenges such as trying to limit the number and impact that certain risks have on the project, the potential occurrence of such risks throughout the project, and the need to ensure that they are well documented in order to enable flexibility of response to various changes that were not expected over the life cycle of a project. Additional studies have focused on investigating particular risk management methods and risks: Based on a review of the literature, understanding the importance of controlling risks to the sustained success of risk management, an unified model for assessment and control of technical risks. The model was validated using a practical application in the medical industry.

3. CONCEPTUAL FRAMEWORK



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4. SUMMARY AND CRITIQUE OF EXISTING LITERATURE

According to [5] in their study indicate that risks in a project can be predictable hence making them easier to identify, while some cannot be anticipated and can result in schedule and time delays which also lead to additional costs that had not be anticipated. The various causes of delays in those projects were approval of drawings by the respective professionals, other delays include delayed payments by the project financiers to the contractors and the various design changes that had not been anticipated. Project sponsors are more concerned with financial issues, while contractors consider contractual relationships as important and consultants consider project management issues to be the most important causes of delays.

In the project management risk lifecycle, the various risks are mainly managed when they occur and not implemented at the project identification process. This leads to the increase of risks occurring that were not anticipated hence no response strategies had been documented. Due to this mistake, the effect on the project's performance with regards of cost and time overpowers the project team. The use of risk management techniques by project managers with limited knowledge in advanced risk management shows their lack of awareness about the current risk management tools and techniques. Hence, there is a need to ensure that the knowledge and application of risk management process in the construction industry by the professionals in Malaysia is implemented.

5. RESEARCH METHODOLOGY

The study adopted a descriptive survey design. In this study, inferential statistics and measures of central, dispersion and distribution were applied. In this study the target population was 554,622 as per the census 2009 in Kakamega County. Simple random sampling was used to choose the respondents in this study. The study used self-administered questionnaires and observation schedules. This study utilized both primary and secondary data. Questionnaires were used to collect primary data which was distributed to the staff.

The Regression analysis was used to analyse the data to show the cause-effect relationship of the factors that risk management practices .The regression model is of the form given below

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Where, Y = Risk management practices

α = Constant

$\beta_1, \beta_2, \beta_3 and\ \beta_4$ = Regression coefficient, ε = Error term

X1= risk identification

X2= risk analysis

6. RESULTS AND DISCUSSION

6.0 Response Rate

Out of the 80 questionnaires administered, 70 respondents returned them. This represents 87% response rate. Reliability analysis was done with the use of Cronbach's Alpha which measures the internal consistency by establishing whether certain items within a scale measure the same construct. Instruments used in research should have reliability of 0.70 and above, thus forming the study's benchmark. Cronbach Alpha was established for every objective which formed a scale.

6.1 Risk Identification

From the findings, the respondents agreed that the experts at each round of using the risk management technique have previous reports from the other experts hence its enables them to avoid repetition which leads to accurate results, the mean was 4.3. The respondents were also asked whether the members of the project team are chosen as panel when using the risk management technique since they have the knowledge required in risk management and majority agreed. The mean of the responses was also 4.2 thus confirming.

Asked whether the project the risk management techniques ensures better decision making since it analyses the opportunities and risks that may occur in the project majority agreed with a mean of 4.3. The respondents were also asked

whether members in these projects are involved in formulation of the risk register and how they are categorized and their probability risk rating; majority agreed with a mean of 4.4. The respondents were asked as to whether members of the project team are involved during the risk identification process since they have the required expertise in the project majority agreed with mean of 3.8. These findings are in line with [3], who informs that It is also very important to consider the expected desired outcome of the project during risk identification. In project management, the required level of detail in any project is considered very crucial since special approaches exist to analyse major risk in complex projects.

6.2 Risk Analysis

From the findings, the respondents were asked whether during the risk analysis, opportunities on how the various uncertainties that may occur are considered, since it might positively influence the outcome of the project respondents agreed; the mean response was 4.0. The respondents agreed that the project team is involved during during the risk analysis since it enables in analysing future events and the impact they have on the project, majority agreed with the mean was 4.2. Slightly more than half of the respondents agreed that through the various technique in risk analysis, the project team is aware of the entire risk management process of the project with a mean of 3.2.

Asked whether to effectively implement the findings of the risk analysis process, all the stakeholders of the project need to be involved in every step since it will enable them to actively participate in the project respondents agreed; the mean response was 4.4. The respondents agreed that the risk analysis results need to be monitored throughout the project since they affect the schedule and budget of the project the mean was 3.8. These findings are in line with [13] which states that the project managers are required to draw up a plan to be used in the project in which there will be predefined risk mitigation procedures which will be indicated in the risk management plan. Furthermore, monitor the tools to be used in order to determine that the results are accurate and will not generate new problems.

6.3 Risk management practices

From the findings, the respondents agreed that Effective risk management processes reduce cost overruns in road construction projects, the mean was 3.9. The respondents were also asked whether the When the project team is involved in the risk management process, it reduces schedule delays since they are aware of the various consequences i.e monetary fines that are charged due to delays where most agreed. The mean of the responses was also 4.5, thus confirming.

Asked whether the cost estimation techniques enable the project team to deliver the project within the set budget since all risks are well calculated from the project initiation phase, respondents agreed; the mean response was 4.3. Majority of the respondents agreed any changes in the project scope is documented for review from the project committee the mean was 4.4. Most of the respondents agreed that effective risk management in road construction projects, ensures that there are guidelines on how the project team will achieve the set milestones and the various incentives given. The various risks and uncertainty that occur in a project a have real impact on the expected returns, the stakeholder cash flow since it is an investment that they hope will gain profits after completion. This is the main reason that the project manager is required to ensure that they maximize on the appropriate risk management process.

6.4 Correlation Results

From the findings, risk identification has a positive and significant relationship with risk management practices ($r = 0.302$, p-value = 0.009) at 0.05 level of significance. This implies that there is a probability of 0.302 that the risk management practices will increase with increase in risk identification. The findings also showed that risk analysis has a positive and significant relationship with risk management practices ($r = 0.668$, p-value = 0.001) meaning that there is a 0. 668 probability that the risk management practices will increase with increase in risk analysis.

6.5. Model Summary

Table below illustrates, the R value indicates a relatively strong correlation between predictor variables and the response variable (risk management practices). This is because the R value is positive (0.614). This means that the variation in the growth was attributed by 61.4% change in the predictor variables. According to the value of the R-Square, 57.1% of the risk management practices could be explained by independent variables of risk identification and risk analysis. Therefore independent variables would have a 57.1% influence on risk management practices while the remaining 42.9% could be attributed to other factors other than predictor variables.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.614a	0.571	0.520	0.495
a Predictors: (Constant), Risk identification, risk analysis				

7. CONCLUSION

Risk identification had a significant positive relationship with risk management practices on performance of road construction projects. 30.9% of the variation in risk management practices on road construction projects can be attributed to risk identification. Risk analysis had a statistically significant positive relationship with risk management practices on performance of road construction projects. From regression analysis, 33.4% of the variation in risk management practices on road construction projects can be attributed to risk analysis. There is a need to involve all the stakeholders during risk identification stage to enable them consider the expected desired outcome of the project. It is vital for the project team to use risk analysis tools as it enables the project team to identify risks and calculate their probability of occurrence and also the impact that they have on the projects planned budget and time schedule.

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