

Effect of Project Risk Management on the Success of the Itunda-Busanza Road Construction Project in Kicukiro District, Rwanda

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Recommended Citation: Rufus, O. E., & Dushimimana, J. D. (2025). Effect of project risk management on the success of the Itunda-Busanza road construction project in Kicukiro District, Rwanda. *African Quarterly Social Science Review*, 2(1), 248-259. <https://doi.org/10.51867/AQSSR.2.1.21>

February 28, 2025 Accepted: March 7, 2025 Published: March 24, 2025

ABSTRACT

This study is about the effect of risk management on project success, and it used the Itunda-Busanza road construction project in Kicukiro district, Rwanda as a case study. The study was guided by the theory of change, the game theory and the prospect theory. The study population was 10,012 and using the Taro Yamane formula, the sample size used in this study was 384 respondents which included the project manager, risk officer, project team members and beneficiaries. The tools of data collection used were the documentations from relevant sources, questionnaires and interviews. This research used a descriptive and correlational research design. Quantitative data obtained from structured questionnaires and qualitative data was obtained through documentation and semi-structured interviews with relevant authorities involved in the project. Data analysis was carried out using the statistical software SPSS. Descriptive statistics such as mean and standard deviation were used to summarise the data obtained and inferential statistics such as the Pearson's Correlation, ANOVA, coefficients test and Multiple Linear Regression. Fisher (F) and P-values were used to test the null hypotheses. In this study, thematic analysis was used to analyse qualitative data. The study findings revealed the R value to be 0.986 which indicates a strong positive relationship between predictor and the dependent variable. The R square value of 0.972 shows that 97.2% of the variability in the outcome variable can be explained by the predictors. The coefficient of the predictors indicate effect on project success. Specifically Risk Identification ($\beta_1=0.666, p=0.00$), Risk Analysis ($\beta_2=0.089, p=0.035$) Risk Response ($\beta_3=0.141, p=0.002$) and Risk Monitoring and Evaluation ($\beta_4=0.098, p=0.03$). This indicates that all the coefficients of the predictors are statistically significant, as indicated by their associated significant values below 0.05. This explains that all four null hypotheses were tested and rejected to accept the alternative hypotheses. The study concluded that all the independent variables of the model specification had the greatest effect on the success of the Itunda-Busanza road construction project in Kicukiro district, Rwanda. The study recommends the practices of Risk Management which involve Risk Identification, Risk Analysis, Risk Response and Risk monitoring and Evaluation to promote project success in all construction projects.

Keywords: Project Success, Risk Management, Risk Identification, Risk Analysis, Risk Response, Risk Monitoring and Evaluation

I. INTRODUCTION

Project success is viewed differently by the project stakeholders and this includes the project manager, the customer or end user, sponsors, and the project team, this is because the project stakeholders are involved in different phases of the project and have different ideas and expectations of project success. Hans and Mnkandla (2019), went ahead to term project success as an “elusive target”. Ika and Pinto (2022) complexified the term “Project Success” and said that project success is based on four things which are benefits realisation, stakeholder perceptions, issues of timing, and sustainability. This means that for a project to be termed successful, it needs to meet the requirements or the expectations of the stakeholders of the project. Project success mainly is concerned with the project's final product, as opposed to the project performance which is measured during the process of the project implementation. Project success is mainly concerned with the outcome of the project. The schedule, budget and quality are the dimensions usually used to measure the success of the project (Muktar et al., 2020). This is because risks that occur during a project can affect the above mentioned dimensions. Another identified dimension is cost performance, it is used to determine project success especially in construction.

Globally, project managers are faced with the never ending possibility that a situation might occur that would cause a significant detriment to their project. Be it a construction project or a health project, risks are inevitable. Risk management is an important aspect of project management and business around the world (Amoah & Pretorius, 2019). For this reason, modern businesses today have taken up the knowledge and skills of project management and project risk management (Vujović et al., 2020), and incorporated it into the daily running of businesses. Muktar et al., (2020) established that economic risk, political risk and many more had an effect on the success of a project. Although this study was limited to oil and gas companies in Yemen, it still established that risk has a role to play in project success.

Not just in the global community, it is seen that in the continent of Africa today, risk management is an important part of projects which can play a role in the determining of project success. Amoah and Pretorius (2019) in their study in South Africa found out that small construction companies with respect to the case study used did not have a risk plan laid out. They stressed that it is paramount for projects to have a risk plan as this would help in the actualization of project outcomes. Simon and Mutiso (2021) in their study carried out in Kenya on the influence project risk management has on performance of agricultural projects established that a lot of risk indicators in projects have positive impact on performance of the agricultural projects.

In a research carried out in Rwanda, Gitau (2015), said that project risk management had an effect on project performance. He stressed that most construction projects in Rwanda had inputs from qualified engineers and architects, but they had not studied risk management and this made the management of risk not adequate and eventually, risk responses planned for to mitigate possible risks. Also, a research carried out in Rwanda by Igihozo and Irechukwu (2022), it was seen that the project risk management procedure has an impact on the performance of the Mpazi Channel construction project.

1.1 Statement of the Problem

One thing every project has in common are the uncertainties that come with them, in other words, the risks are inevitable in projects. When project managers fail to incorporate risk management in their project, this attitude often leads to circumstances in which the project does not meet its laid out objectives. Amoah and Pretorius (2019) stated that construction companies fail to take risk mitigation seriously even if the majority of the risks are shouldered by them. They went ahead and evaluated the impact of risk management on project performance in small construction firms in South Africa. Ekung and Adu (2020) focused on the limitation of risk identification tools applied in project management in Nigerian construction industries. Igihozo and Irechukwu (2022) focused on Project Risk Management Process and Performance of Mpazi Channel Construction Project in Nyabugogo, Kigali-Rwanda, Masimbi (2023) focused on the Relationship between Project Consultants' Performance and Project Success in the Rwandan Construction Industry, none of them focused on the Itunda-Busanza road project.

The expected outcome of the NPD Company when constructing the Itunda-Busanza road was to link the Kigali neighbourhood and reduce congestion of the main corridor from airport to Sheraton hotel, city of Kigali. According to the project manager in charge of the project, the project faced some risks such as operational risks especially with the members of the community that lived around the vicinity of the project and supply risks according to the procurement officer in charge of the project. Nevertheless, to the best of my knowledge, none of the previous studies focused on the Itunda-Busanza road construction project. No specific study has been conducted to investigate how risk management was done, if yes, if and how it affected its success, hence the gap in data availability. Therefore, this study intends to bridge the gap by assessing the effect of risk management on project success by using the Itunda-Busanza road construction project in Rwanda as a case study. If this study is not done, the consequences will be that the true practical effect of risk management on success of projects will not be known, but if it is done, the benefit will be notable because it will inform project managers on the effect of risk management on project success.

1.2 Research Objectives

- i. To examine the effect of risk identification on the success of the Itunda-Busanza road construction project in Kicukiro district.
- ii. To find out the effect of risk analysis on the success of the Itunda-Busanza road construction project in Kicukiro district.
- iii. To assess the effect of risk response on the success of the Itunda-Busanza road construction project in Kicukiro district.
- iv. To examine the effect of risk monitoring and evaluation on the success of the Itunda-Busanza road construction project in Kicukiro district.

1.3 Research Hypotheses

H₀₁: Risk identification has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.

H₀₂: Risk analysis has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.

H₀₃: Risk response has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.

H₀₄: Risk monitoring and evaluation has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Theory of Change

The theory of change was designed as a tool to help clearly articulate underlying assumptions, it functions as a series of hypotheses (often in the form of a diagram) that is being brought forward on how change will occur during a project (Reinholz & Andrews, 2020). Reinholz and Andrews (2020) further defines the theory of change as a particular approach that makes the assumptions in a project explicit, and uses the desired outcome of the project as a landmark to guide the project planning, project implementation and project evaluation. Theory of Change has helped as it is used as a framework for structuring and assessing complex systems.

Theory of Change provides a roadmap for understanding how strategies put in place can lead to desired outcomes, particularly in the context of risk management. It was used to understand how involved stakeholders identified potential risks, root causes and in turn ensuring interventions to mitigate risks in order to achieve expected outcomes of the project.

2.1.2 The Prospect Theory

Prospect theory was originally developed to be a behavioural economic theory by Daniel Kahneman and Amos Tversky in 1979. The prospect theory helps in understanding how individuals make decisions under risk and uncertainty especially in situations where potential gains and losses are expected. This theory states that individuals instead of always aiming for the option with the highest expected value, as traditional economic theories assume, prospect theory suggests that individuals evaluate choices based on perceived gains and losses relative to the situation in which they are trying to make a decision. This simply means that individuals, instead of going with the option that they expect will give them a higher expected outcome just as traditional economists suggest, they instead would make decisions basing it on the losses and gains they have sensed while weighing their options (Kahneman & Tversky, 1979).

In this research, the prospect theory has given an insight as to why individuals make certain decisions that might seem irrational. It says that emotions, perception might be linked to how individuals make decisions, especially in situations that involve risk and uncertainties. Taylor (2024) in his work on behaviour finance highlighted an example on the prospect theory in financial markets, it can be seen in panic selling or buying during downturns and bull runs.

2.1.3 The Game Theory

The game theory was founded by a mathematician from Hungary named John von Neumann in the year 1928. Game theory is a branch of mathematics and microeconomics focused on the analysis of strategies in competitive contexts. Project managers use a number of tools in the management of risks and the use of the game theory has in recent times been applied to that (Piraveenan, 2019). Piraveenan (2019) says that the game theory is used when there are two or more entities involved whether in cooperation or competition, in his study he stated that game theory is useful in the modelling scenarios in project management. Game theory is used to study decision making strategically, also it is important in the study of behavioural patterns in different systems with the goal of maintaining cooperation in organisations (Perc et al., 2017). The game theory can be sectioned into two which are the Non-cooperative games theory and the cooperative game theory. This theory in this research was used to understand and explain interdependent risks and also a framework for analyzing decision-making in situations involving uncertainty, and strategic interactions.

2.2 Empirical Review

2.2.1 Risk Identification and Project Success

Chattapadhyay et al, (2021) in their work highlighted risk identification as one important part of project management especially in construction. In their work, they highlighted according to the findings of their research that risk identification affects the success rate of projects, they identified possible risks using machine language techniques

and further went ahead to cluster the factors into project success variables such as cost effectiveness, time management, quality and scope of the project. They concluded that the process of risk identification cannot be over emphasized, because singling out possible risks, their root causes and corresponding risk components can help the project or risk managers achieve project success.

2.2.2 Risk Analysis and Project Success

Aven and Flag (2020) in their work, stressed how over the last 40 years, risk analysis has been a fast growing tool in understanding, accessing and managing risk. Ekung and Adu (2020) in their work on the limitations of risk identification tools stated that the success of risk management relies significantly on the risk identification phase or process. They found out that the tools used in risk identification have their weaknesses and like a ripple effect it affects the whole risk management process. This is because risk identification is a very vital aspect of risk management and if there are any lapses in the risk identification process it affects the risk management process.

2.2.3 Risk Response and Project Success

Zhang, et al., (2020) in their work said that a risk response is originally made to change the trajectory of a particular risk, oftentimes even though a risk response has been planned for a risk, the effect of the risk might be much more than the response that was planned for it. They went ahead to say that even if a risk response is successful in either mitigating a particular risk or eliminating it, most times, it ends up bringing up another risk. The findings from Zhang, et al., (2020) shows how important the risk identification, monitoring and evaluation are in risk management and project success as a whole. It shows that updating the risk register with newly identified risk and possible responses and also analysing it is a continuous process.

2.2.4 Risk Monitoring and Evaluation and Project Success

Aikpokhio et al., (2024) in their work concluded that effective monitoring and evaluation ensures that risk management plans are continuously assessed and adjusted throughout the project. This involves tracking identified risks, analyzing newly emerging risks, and evaluating the efficacy of response strategies. Studies highlight that proactive risk monitoring helps to minimize delays, reduce budget overruns, and improve stakeholder confidence, which are essential for project success.

III. METHODOLOGY

3.1 Research Design

This research used a descriptive and correlational research design. The research is descriptive because it attempts to answer the question of how risk management practices were implemented in the case of Itunda-Busanza road construction project, in Kicukiro district, Rwanda. The descriptive part of the study describes the project success level of the Itunda-Busanza road construction project in terms of effectiveness, efficiency, impact and sustainability (Tesfaye, 2022). The research is correlational because it attempts to answer the research hypothesis and this was done through collecting data and then using quantitative methods for analysis (Tesfaye, 2022).

3.2 Data Collection Method

The researcher used various instruments for gathering information from respondents, such as questionnaires, interview guides, and past documents such as published and unpublished research, textbooks, articles and relevant documents.

3.3 Target Population and Sampling Procedure

The target population for this study consisted of the stakeholders of this project. These consisted of 10,012 persons: the project manager (1), risk manager (1), beneficiaries (10,000), and project team members (10). A sample of 384 was obtained from this population through the use of the Taro Yamane Formula which is highly recommended when working with a countable population size. Table 1 shows the breakdown of the sample size used in the research into strata.



Table 1

Target Population and Sample Size

Category	Population Size	Sample size
Project manager	1	1
Risk officer	1	1
Project team members	10	10
Beneficiaries	10,000	372
Total	10,012	384

3.4 Data Analysis Techniques

In this study, thematic analysis was used to analyse qualitative data (words and observations), while descriptive statistics (descriptive analysis) and inferential statistics (correlation and regression analysis) were used to analyse quantitative data.

IV. FINDINGS & DISCUSSION

4.1 Descriptive Statistics

The distribution of respondents' Likert scale ratings for various propositions was shown using the mean, and the standard deviation. Table 2 presents findings on the first objective of the study, namely the effect of risk identification on the success of the Itunda-Busanza road construction project in Kicukiro District.

Table 2

Risk Identification on the Success of the Itunda-Busanza Road Construction Project.

Statements	Mean	Std. Dev.
Possible financial risk was identified during the planning phase of the road construction project.	4.24	0.89
Risks that could be faced during the day to day operation of a project were identified before the implementation of the project.	4.32	0.79
Possible supply risks were identified during the planning phase of a project.	4.04	0.87
Schedule/time risks associated with the Itunda-Busanza construction projects were identified during the planning phase of a project.	4.08	0.80
Technological risks associated with the Itunda-Busanza road construction project were identified during the planning phase.	4.12	0.83
Overall mean and standard deviation	4.16	0.75

The result in Table 2 shows that the participants of this study expressed agreement that risk identification has an effect on success of the Itunda-Busanza road construction project in Kicukiro district with an overall high mean of 4.16 and the overall heterogeneous standard deviation of 0.75. It shows a positive agreement among the participants.

Firstly, it is evident that possible financial risks were identified during the planning phase of the project, with a high mean of 4.24 and a heterogeneous standard deviation of 0.89. This shows that the respondents have expressed a positive agreement with the responses being heterogeneous. Additionally, the respondents expressed concurrence that possible day to day operational risks that can be faced during the implementation of the project should be identified, with a very high mean of 4.32 and a heterogeneous standard deviation of 0.79. This shows a high positive agreement among the participants. Furthermore, there is also a positive agreement on the identification of possible supply risk during the planning phase of the project, the study expressed a high mean of 4.04 and heterogeneous standard deviation of 0.87. Similarly, the data has shown that there is a high level of agreement that schedule risks should be identified during the planning phase of the project with a high mean of 4.08 and a standard deviation of 0.80. This indicates a positive agreement with this statement. Finally, the respondents rated that associated technological risks should be identified during the planning phase of the project with a high mean score of 4.12 and a heterogeneous standard deviation of 0.83. This indicates that it was a positive agreement among respondents.

The project manager in charge of the project during an interview stated that during:

“The planning phase of this project, one of the identification of methods that were used to identify possible risks that could occur during this project were interviewing the residents of the areas, brainstorming with project team members and comparing with similar project that we have done.”

The senior risk manager backed up this statement during an interview and stated that:

“Identifying possible risk is important in a project and it is done before implementation by brainstorming, interviewing and observing.”

The Game theory would assist this study as long as it helps project managers to carefully understand and model possible scenarios, which will in turn give an insight to the identification of possible risk occurrences in a project. Piraveenan (2019) stressed the importance of the Game theory in project management especially when two or more entities are involved. This helps in the ability of entities to “identify pay offs” and form coalitions.

The findings for the second objective of the study, to find out the effect of risk analysis on the success of the Itunda-Busanza road construction project in Kicukiro district, were presented in Table 3.

Table 3

Risk Analysis on the Success of the Itunda-Busanza Road Construction Project

Statement n=384	Mean	Std. Dev.
Quantifying risks mathematically was an effective way to analyse already identified risks in the Itunda-Busanza road construction project.	3.56	0.75
Quantitative risk analysis like expected monetary values was used in quantifying risk mathematically.	3.57	0.73
Quantitative risk analysis like Net Present Value (NPV) analysis was used to quantify risk mathematically.	4.24	0.68
Using qualitative methods is an effective way to analyse already identified risk in the Itunda-Busanza road construction project.	4.24	0.68
Qualitative methods such as interviewing professionals and beneficiaries are essential in analysing risk.	4.03	0.72
Qualitative methods such as brainstorming is essential in analysing risk.	4.00	0.78
The qualitative analysis method of getting data from past similar projects is essential in analysing risk.	4.67	0.85
Overall mean and standard deviation	4.05	0.66

The result in Table 3 shows that the respondents have a positive agreement that risk analysis has an effect on the success of the Itunda-Busanza road construction project in Kicukiro district. This was expressed with a high overall mean score of 4.05 and a heterogeneous standard deviation of 0.66.

Firstly, the respondents rated that quantifying risk mathematically is an effective way to analyse possible risk that have been identified in the Itunda-Busanza road construction project with a high mean of 3.56 and a heterogeneous standard deviation of 0.75. This indicates a positive agreement among respondents that analysing risk mathematically contributed to the analysis of risk. Additionally, the respondents expressed agreements that expected monetary value analysis as a form of quantitative analysis was used during the analysis of risks process with a high mean score of 3.57 and a heterogeneous 0.73, this shows a positive agreement. Jointly, the participants expressed agreement that the net present value analysis was used to quantify risk mathematically with a high mean of 4.24 and a heterogeneous standard deviation of 0.68. This shows that the participants show a positive agreement on the statement. Similarly, the respondents rated the use of qualitative methods to analyse identified risk a high mean score 4.24 and a heterogeneous standard deviation of 0.68, this indicates that the respondents show a positive agreement on the statement. Furthermore, the respondents rated a high mean of 4.03 and a heterogeneous standard deviation of 0.72 that interviewing professionals and beneficiaries is an essential part of analysing risks, this indicates a positive agreement among respondents. In addition, the data has shown a high level of agreement with a heterogeneous response (mean = 4.00 and standard deviation = 0.78) regarding if qualitative methods of risk analysis such as brainstorming was essential in risk analysis. Finally, the respondents expressed a positive agreement that getting data from past similar projects was essential in the qualitative analysis of risk with a very high mean of 4.67 and a heterogeneous standard deviation of 0.85.

One of the project team members during an interview said that during:

“The team meetings, quantitative and qualitative analysis were done with information from prior knowledge and experience with similar projects.”

The risk manager further added that

“After risks were analysed and they were prioritised from critical to low risk. The project manager added that the risks after analysis are integrated into the overall project plan and are classified based on their likelihood to occur and on the possible impact it might have on the project. Also, adjustments were made on project schedules, budgets, or resource allocations based on risk analysis results.”

The Prospect theory developed in 1979 is a behavioural economic theory that gives an insight to the data from the study. Kahneman and Tversky (1979) in their study stressed that individuals before making decisions especially in situations which involve perceived gains and losses, instead of going the traditional way of making decisions based on what is perceived would give a higher outcome would instead first weigh the opinions carefully in terms of losses and gains. This explains how risk managers and project managers first analyse risks to weigh the losses and gains before making decisions as opposed to the traditional method of making decisions based on perceived gains and losses.

Furthermore, Table 4 presents the findings related to the third objective, which was to assess the effect of risk response on the success of the Itunda-Busanza road construction project in Kicukiro District.



Table 4

Risk Response on the Success of the Itunda-Busanza Road Construction Project.

Statement n=384	Mean	Std. Dev.
Risk avoidance was implemented as a risk response during this project.	3.91	0.85
Risk acceptance was implemented in a timely manner, minimising delays and disruptions to project activities.	4.08	0.87
Risk mitigation was implemented as a risk response during this project	4.15	0.87
Risk transfer was implemented in a timely manner, minimising delays and disruptions to project activities.	4.20	0.86
Sharing risk is an effective way of responding to risks in a project.	4.67	0.85
Overall mean and standard dev	4.20	0.79

The result in Table 4 shows that the respondents have a positive agreement that risk response has an effect on the success of the Itunda-Busanza road construction project in Kicukiro district. This was expressed with a high overall mean score of 4.20 and a heterogeneous standard deviation of 0.79.

Firstly, the data presented shows that the respondents have expressed a high level of agreement with a heterogeneous response that risk avoidance was implemented as a form of risk response during the implementation of the project. It can be seen that there is a positive agreement with this statement among respondents with a mean score of 3.91 and a standard deviation score of 0.85. Additionally, the data shows a positive agreement with the statement of risk acceptance should be done in a timely manner to minimise delays and disruptions. This had a high mean score of 4.08 and a heterogeneous standard deviation of 0.87.

Furthermore, the respondents expressed agreement that risk mitigation was implemented as a risk response during the Itunda-Busanza road construction project. This can be seen that there is a positive agreement with this statement with a high mean of 4.15 and heterogeneous standard deviation of 0.87. Moreover, the participants expressed agreement that the risk transfers were implemented in a timely manner to avoid delays and disruption during the implementation of the project, this data expressed a high mean of 4.20 and heterogeneous standard deviation of 0.86. This shows a positive agreement with the statement. Finally, the respondents agreed with the statement that sharing risk is an effective way of responding to risks, this showed a positive agreement with a very high mean of 4.67 and a heterogeneous standard deviation of 0.85.

In an interview with the project manager, he stated that

“The risk response planning for the Itunda-Busanza road construction project involved avoiding, accepting, mitigating and transferring risks.”

He stated that:

“One of the first things done was to insure the project to provide a safety net and to ensure continuity of the project.”

In an interview with the risk officer, he stated that:

“To ensure the project team’s flexibility and adaptability to the risk responses, continuous monitoring was done.”

The Prospect theory can also be used as a valuable framework. As explained above, the prospect theory explains that before making decisions, individuals would first weigh options to determine the possible gains and losses (Kahneman & Tversky, 1979). This is seen evidently in the risk response data, project managers and risk managers often weigh the possible losses and gains after analysing risks before coming up with the appropriate response for each risk.

Table 5 presents the findings for the fourth objective of the study, namely to examine the effect of risk monitoring and evaluation on the success of the Itunda-Busanza road construction project in Kicukiro District.

Table 5

Risk Monitoring and Evaluation on the Success of the Itunda-Busanza Road Construction Project

Statement n=384	Mean	Std. Dev.
Risk monitoring tools were consistently used to monitor risk responses that were adopted throughout the project life cycle	4.38	0.87
Using the risk register is an effective way of monitoring risk response	3.93	0.89
Field visits at each milestone were important in monitoring risks.	4.03	1.07
Monitoring the progress reports helps in keeping track of the risks that have been identified, analysed and responded to.	4.40	0.87
Risk evaluation tools were consistently used throughout the project life cycle.	3.94	1.13
Periodic assessments of projects help to evaluate risks.	3.78	0.94
Aggregate mean and standard deviations	4.11	0.77



The result in Table 5 shows that the respondents have a positive agreement that risk M&E has an effect on the success of the Itunda-Busanza road construction project in Kicukiro district. This was expressed with a high overall mean of 4.11 and a heterogeneous standard deviation of 0.77.

Firstly, the data represented in shows the respondents have a positive agreement that risk monitoring tools should be used to monitor risk responses that were adopted. The data showed a very high mean of 4.38 and a standard deviation of 0.87. Continuously, the data showed that the respondents regarding the use of risk registers as a way of monitoring risk had a positive agreement with a high mean of 3.93 and a heterogeneous standard deviation of 0.89. Additionally, the respondent rated field visits at each completed milestone of the project a high mean of 4.03 and a heterogeneous standard deviation of 1.07. This indicates the respondents have a positive agreement with the statement. Furthermore, respondents rated that monitoring the progress reports helps in keeping track of the risk with a very high mean of 4.40 and a heterogeneous standard deviation of 0.87. This data shows a positive agreement among respondents. Furthermore, the fifth statement asked if risk evaluation tools were used during the life cycle of the project, the data shows a positive agreement among respondents with a high mean of 3.94 and a heterogeneous standard deviation of 1.13. Lastly, the periodic assessment of projects to help to evaluate risk was rated a high mean of 3.78 and a heterogeneous standard deviation of 0.94. This data has shown that there is a positive agreement between respondents. In an interview with the risk officer, he stated that:

“Risk assessment through the use of a risk register was used to continuously monitor project risk quarterly in a comprehensive manner.”

He also stated that

“Findings from the project were documented and used to improve future risk management practices.”

Theory of Change and in recent times have been introduced to the world of project management. Specifically in project implementation and monitoring and evaluation. The ToC as it is called is a framework that identifies steps that are required to achieve a particular outcome. Alberts et al. (2020) in their work stressed the vitality of the ToC in monitoring and evaluation. They went ahead to say that it focuses on the result that will be achieved by making sure processes that are leading to the final outcome are put in check. They added that the ToC produces a conceptual framework to help guide to achieve the desired outcome. The theory of change also proposes that in order to achieve the effect of M&E, emphasis is needed for clear and consistent communication and coordination among project stakeholders to produce the desired outcome.

Table 6 presents the findings for the dependent variable, which was the success of the Itunda-Busanza road construction project in Kicukiro District.

Table 6
Itunda-Busanza Road Construction Project Success in Kicukiro

Statement n=384	Mean	Std. Dev.
Risk management practices contributed to the success of the Itunda-Busanza road construction project in terms of achieving its goal.	4.28	0.65
Risk management contributed to achieving the objectives that were set out for the Itunda-Busanza road construction.	3.96	0.99
Efficiency in terms of the allocation of resources impacted on the success of the Itunda-Busanza road construction project.	4.26	0.96
The Impact of the Itunda-Busanza road construction on the society/beneficiaries contributed to the success of the project.	4.08	0.83
Sustainability of the Itunda-Busanza road construction project would contribute to the success of the project.	4.08	0.83
Overall Mean and Standard Deviation	4.12	0.84

The result in Table 6 shows that the respondents expressed agreement with the assertion on project success of the Itunda-Busanza road construction project in Kicukiro district. This was expressed with a high overall mean of 4.12 and a heterogeneous standard deviation of 0.84.

The first statement emphasised that if risk management practices had a contribution to the ability of the project to meet its goal, this statement had a high mean score of 4.28 with a heterogeneous standard deviation of 0.65. This data shows a positive agreement with a heterogeneous response. Continuously, the data showed risk management contributed to the ability for the project to achieve its objectives has a high mean of 3.96 and a heterogeneous standard deviation of 0.99, this data has expressed a positive agreement. Additionally, the respondents rated that resource allocation determined the success of the project had a high mean score of 4.26 with a heterogeneous response of 0.96 standard deviation. This indicates that the respondents had a positive agreement with this statement. Continuously, the statement about if the impact of the Itunda-Busanza road construction project determines the success of the project had a high



mean score of 4.08 with a heterogeneous response of 0.83 standard deviation. This shows that the respondents agreed positively with this statement. Finally, the statement about the sustainability of the project being a determinant of project success has a mean score of 4.08 with a heterogeneous response of 0.83 as standard deviation. This indicates a strong positive agreement among respondents.

With this study, the respondents of the research have agreed that risk management has a positive effect on the success of the Itunda-Busanza road construction project. With an overall mean of 4.12 with a heterogeneous response of 0.84 standard deviation. These findings align with the work done by Tesfaye (2022), who worked on the role of project risk management practices for project success. In his conclusion, he said that for a project to be concluded on time and efficiently, there has to be effective project risk management set in place, in terms of identification, analysis and response.

4.2 Inferential Statistics

For this study, inferential statistics play a crucial role in the study of hypothesis testing by enabling researchers to draw conclusions that cannot be derived from descriptive statistics.

4.2.1 Regression Analysis

Table 7 shows the model summary for the regression analysis carried out. The model includes the predictors which includes risk identification, risk analysis, risk response and risk M&E, and also the dependent variable which is the project success. The R value 0.986 indicates a strong positive relationship between the predictors and the dependent variable. The R Square value of 0.972 shows that 97.2% of the variability in the outcome variable can be explained by the predictors. The adjusted R Square value of 0.972 accounts for the number of predictors/ constants and also provides a slightly more conservative estimate of the model’s goodness of fit. Overall, this model summary results have indicated a significant relationship between the risk management practices and project success.

Table 7
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.986 ^a	.972	.972	.1403991

Table 7 shows the model summary for the regression analysis carried out. The model includes the predictors which includes risk identification, risk analysis, risk response and risk M&E, and also the dependent variable which is the project success. The R value 0.986 indicates a strong positive relationship between the predictors and the dependent variable. The R Square value of 0.972 shows that 97.2% of the variability in the outcome variable can be explained by the predictors. The adjusted R Square value of 0.972 accounts for the number of predictors/ constants and also provides a slightly more conservative estimate of the model’s goodness of fit. Overall, this model summary results have indicated a significant relationship between the risk management practices and project success.

The findings of this research aligns with the study by Al Mhirat and Irtemeh (2017) who highlighted in their finding the effect of risk management on project success. The model’s summary ability to show that 97.2% of the variance indicated in project success stressed the pertinence of risk identification, risk analysis, risk response and risk M&E.

Table 8
Analysis of Variance

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	260.203	4	65.051	3300.070	.000 ^b
	Residual	7.471	379	.020		
	Total	267.673	383			

The F-statistics in Table 8, has a value of 3300.070 which shows the results of the ANOVA, which is the Analysis of Variance for the regression model. The significance level is shown as .000, which is less than the typical significance threshold of 0.05. This shows that the predictors which include the risk identification, risk analysis, risk response and risk M&E are statistically significant and there is strong evidence to say that at least one of the predictors in the model has a significant effect on the dependent variable which is project success.

This aligns with Boampong (2021) who emphasised that strategic risk management positively influences development of project success. The research stressed the importance of aligning risk management strategies with



project objectives and the expectation of stakeholders while maintaining flexibility and transparency. The findings collectively play a significant role in explaining project success variance, which in turn reinforces the crucial role of risk identification.

Table 9
Regression Coefficients

Model		Coefficients				
		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		B	Std. E	Beta		
1	(Constant)	-0.491	0.051		-9.652	0
	Risk identification	0.743	0.05	0.666	14.999	0
	Risk analysis	0.113	0.053	0.089	2.111	0.035
	Risk response	0.149	0.048	0.141	3.126	0.002
	Risk M&E	0.106	0.049	0.098	2.175	0.03

- a. Predictors: Risk identification, Risk analysis, Risk response, and Risk M&E.
- b. Dependent Variable: Project success.

The table 9 displays a result of significance test and it indicates that for risk identification $p = (0.00)$, risk analysis $p = (0.035)$, risk response ($p = 0.002$) and risk M&E ($P = 0.03$). These values were all significant at $p < 0.05$ and 95% confidence level. A beta value of 0.666 indicates that a unit increase of risk identification contributed to 66.6% increase in project success; a beta value of 0.089 indicates that a unit increase of risk analysis contributed to 8.9% increase in project success; a beta value of 0.141 indicates that a unit increase of risk response contributes to 14.1% increase of project success; a beta value of 0.098 indicates a unit increase of risk M&E contributes a 9.8% increase in project success.

The findings are supported by Aldeen and Sarhan (2024) emphasis on risk management importance for the success of a project. They highlight the individual contributions of risk identification, risk analysis, risk response and risk M&E as strong predictors for project success, which aligns with focus on the four dimensions of risk management and their impact on project success.

4.2.2 Hypothesis Testing

The four hypotheses of statistical significance under this study of risk management were tested in the table below.

Table 10
Hypothesis Testing

Null Hypotheses	P-Value	Observation
H0 ₁ : Risk identification has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.	0	Rejected
H0 ₂ : Risk analysis has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.	0.035	Rejected
H0 ₃ : Risk response has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.	0.002	Rejected
H0 ₄ : Risk monitoring and evaluation has no significant effect on project success in the Itunda-Busanza road construction project in Kicukiro district, Rwanda.	0.03	Rejected

The results of the hypothesis testing in Table 10 provides an overview into the effect of risk management on the success of the Itunda-Busanza road construction project in Kicukiro district. The H0₁, H0₂, H0₃ and H0₄ were rejected because the $p < 0.05$. This shows that there is evidence against the hypothesis that the risk management practices have no significant effect on project success in regards to the Ituda Busanza road construction project. Specifically, risk identification ($p = 0.00 < 0.05$), risk analysis ($p = 0.035 < 0.05$), risk response ($p = 0.002 < 0.05$) and risk monitoring and evaluation ($p = 0.03 < 0.05$). All, individually, have demonstrated a significant effect on the success of the Itunda Busanza road construction project, in Kicukiro district.

Masimbi (2023), focuses on the study of operational risk management and project success in Nyagatare District Rwanda. The data was analysed by descriptive statistics, correlation and regression analysis. The study concluded that there was a significant relationship between operational risk management- identification, monitoring as well as mitigation and project success in terms of timely completion, cost performance and stakeholder satisfaction. The study

went ahead to recommend that the leadership involved in the Lake Victoria Water and Sanitation project should adopt operational risk management which involves identification, monitoring and mitigation as a methodology and knowledge field when implementing a new project.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The descriptive analysis findings showed that risk identification had an overall mean of 4.16, standard deviation of 0.75, risk analysis had an overall mean of 4.05, standard deviation of 0.66, risk response had a mean of 4.20, standard deviation of 0.79, and risk M&E had a mean of 4.11 and a standard deviation of 0.77. The inferential statistics analysis indicated a strong positive relationship between risk management practices and project success. The four null hypotheses (Ho) were rejected with ($p < 0.05$) indicating strong evidence against the null hypotheses that risk management practices have no significant effect on project success. This implies that the null hypotheses were rejected to accept the alternative hypotheses which indicated that the independent variables (Risk Identification, Risk Analysis, Risk Response and Risk monitoring and evaluations) have a significant statistical effect on the dependent variable (Project Success).

The findings of the study show that risk identification, risk analysis, risk response and risk M&E have both strong positive relationship and significant effect with and on the success of the Itunda-Busanza road construction project in Kicukiro district, Rwanda.

5.2 Recommendations

Based on the findings, it is evident that the process of risk management needs to be applied in construction. Therefore, this study would like to recommend that the Government of Rwanda, through the Ministry of Infrastructure, should mandate comprehensive risk assessments as part of project approvals.

Establish clear policies requiring risk management plans at each project phase, supported by training for contractors on best practices. Implement a standardised framework for risk identification, assessment, and mitigation, tailored to Rwanda's construction context. Regularly monitor compliance through audits and tie adherence to licensing and funding eligibility. Encourage the use of technology and tools for risk tracking and promote collaboration between stakeholders to ensure accountability and proactive risk handling.

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