Effect of Risk Management Practices on Project Performance: A Case of Rwanda Urban Development Project

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Abstract: *This study aimed to assess the effect of project risk management on performance of Rwanda Urban Development Project (RUDP) in Rwanda. A descriptive and correlational research design was applied, and data analysis was conducted using SPSS to examine the relationship between project risk management practices and project performance. The R-value of 0.862 signifies a strong relationship between the independent variables and project performance, as values above 0.7 indicate a strong effect. The R-Square value of 0.742 indicates that 74.2% of the variations in project performance are explained through project risk identification, risk analysis, response planning, monitoring and control. A unit increase in project risk identification results in a 0.249 increase in project performance (β = 0.249, t = 4.195, p = 0.000), confirming its significance. A unit increase in project risk analysis leads to a 0.217 increase in project performance (β = 0.217, t = 2.771, p = 0.006), reinforcing its role in reducing project uncertainties. Project risk response planning contributes positively, with a unit increase leading to a 0.272 rise in project performance (β = 0.272, t = 3.151, p = 0.002), demonstrating its importance. Likewise, project risk monitoring and control positively impacts project performance. With a unit increase resulting in a 0.204 increase (β = 0.204, t = 3.029, p = 0.003). The study recommended that project managers establish a detailed scope definition framework and ensure strict adherence to guidelines throughout execution to prevent scope creep and maintain project focus.*

Keywords: *Project Risk Management, Project Performance, Project Risk Identification, Risk Analysis, Risk Response Planning, Risk Monitoring and Control*

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1. Introduction

Risk management is a cornerstone of effective project management, with its successful implementation often determining the overall performance and impact of development projects (Project Management Institute. The Rwanda Urban Development Project (RUDP), an initiative aimed at addressing urbanization challenges and fostering sustainable development, has encountered significant obstacles, including project delays, budget overruns, and quality compromises. These issues underscore the persistent challenges in effectively applying risk management practices within large-scale urban projects in Rwanda (Niragire & Kwena, 2024).

Deficiencies in quality are a persistent problem for construction projects in Rwanda. Uwiringiyimana, Geng and Li (2022) conducted a survey of construction professionals in Rwanda and found that 82% reported encountering quality issues on projects. The study identified factors such as a lack of skilled labor, inadequate supervision, and poor communication between contractors and subcontractors as contributing to these issues. Effective stakeholder engagement, including involving qualified professionals and fostering open communication channels, can help to ensure that

quality standards are met throughout the construction process.

Delays are another major challenge for projects performance in Rwanda. A study by Mukiza, Hanbin & Li (2021) analyzing public construction projects in Rwanda found that 68% of projects experienced schedule delays. The study attributed these delays to factors such as material shortages, changes in project scope, and poor coordination between stakeholders. Proactive stakeholder engagement, including involving key stakeholders in planning and scheduling decisions, can help to identify potential issues early on and develop mitigation strategies, ultimately minimizing delays.

The difficulties are highlighted in the auditor general's report, 2023, which details 37 contracts, totaling Frw 201,017,126,883, that have been postponed across 28 government entity and project types (Iradukunda & Akims, 2024). Notably, 33% of Kigali City's RUDP II projects had delays, and 52% went over budget. A lack of cohesiveness among the team, a scarcity of qualified workers, and inadequate contractors are all variables that contribute (Shema & Hategekimana, 2022).

Several studies have explored development projects in Rwanda, focusing on challenges like delays, quality issues, and budget overruns. However, few have examined the Rwanda Urban Development Project (RUDP). The study on risk management practices within RUDP identified key risk factors, assessed their impact on project performance, and recommended strategies to mitigate delays, enhance quality, and manage budgets, ensuring more successful project outcomes in future urban development initiatives.

This study aimed to determine the effect of project risk management on project performance of Rwanda Urban Development Project (RUDP) of REMA in Rwanda.

Specific objectives

1. To examine the effect of project risk identification on performance of Rwanda Urban Development Project.
2. To assess the effect of Project Risk Analysis on performance of Rwanda Urban Development Project.
3. To find out the effect of project risk response planning on performance of Rwanda Urban Development Project.
4. To determine the effect of Project Risk Monitoring and Control on performance of Rwanda Urban Development Project.

The following hypotheses were used to guide the research:

Ho1: Project risk identification has no significant effect on performance of Rwanda Urban Development Project;
Ho2: Project Risk Analysis has no significant effect on performance of Rwanda Urban Development Project;
Ho3: Project risk response planning has no significant effect on performance of Rwanda Urban Development Project;
Ho4: Project Risk Monitoring and Control has no significant effect on performance of Rwanda Urban Development Project;

2. Literature Review

2.1 Theory of Constraints (TOC)

The Theory of limitations (TOC), initially created by Eliyahu M. Goldratt in 1984, focuses on identifying and eliminating the limitations or bottlenecks that restrict an organization's capacity to fulfill its objectives. Goldratt's research on manufacturing systems discovered that boosting performance in non-constrained areas delivers little advantage until the most limiting bottleneck is addressed. The TOC technique focuses on optimizing processes by first identifying the most essential constraint and then allocating system resources to solve that constraint (Bloom, 2024).

The basic idea behind TOC is that any system, whether in manufacturing, service, or project management, has at least one restriction that restricts its total performance. Goldratt's methodology transformed thinking in production and operations management by giving a formal way for identifying, exploiting, and resolving limitations, hence increasing system efficiency and throughput. TOC has now grown into a variety of domains, including supply chain management, healthcare, and project management (Orue et al., 2021). As industries become more complex and competitive, the importance of TOC in detecting and eliminating bottlenecks remains critical to increasing organizational performance. Technological developments in data analytics and automation are projected to improve constraint detection, enabling firms to react more swiftly and effectively (Tang et al., 2024).

The Theory of Constraints was used in this study to examine how identifying and addressing bottlenecks in the RUDP's processes can improve project performance. The theory assists in understanding how focusing on key constraints within project planning and execution can lead to greater efficiency and optimized use of resources.

2.2 Empirical Review

Schipper *et al.* (2023) assessed the role of effective risk identification and prioritization in enhancing climate adaptation strategies in coastal communities. The study focused on three coastal communities, employing qualitative methods such as in-depth interviews and focus group discussions with key stakeholders, including community members, local government officials, and representatives from Non-Governmental Organizations (NGOs). The research revealed that communities that actively engaged in participatory processes for identifying and prioritizing climate risks developed a more nuanced understanding of their vulnerabilities. This, in turn, led to the creation of more targeted and effective adaptation strategies. The study highlighted the importance of including diverse community voices in the risk identification process, as such approaches were linked to the successful design and implementation of climate adaptation strategies that were both practical and locally relevant.

Simon and Mutiso (2022) examined how project risk management practices effectd the performance of agricultural projects in Nakuru County, Kenya. The study sought to explore the impact of risk identification and risk assessment practices on the overall performance of agricultural projects in the region. Using a descriptive research design, the study focused on 116 agricultural projects, with a high response rate of 93.97%. Regression analysis was applied to determine the relationship between risk management practices and project performance. The findings revealed that both risk identification and risk assessment had a statistically significant impact on the performance of agricultural projects. At a 5% confidence level, the study demonstrated that effective risk management practices could enhance the outcomes of agricultural projects. These results suggest that better risk management could lead to improved efficiency and success in agricultural project execution.

Byamungu *et al.* (2019) examined the impact of risk management practices on the corporate investment strategies of commercial banks in Rwanda. Using a descriptive research approach, the study gathered data from 77 respondents, including managers from finance, operations, risk compliance, and internal audit departments within the banks. The study found significant correlations between operational risk (r=0.096, p<0.01) and market risk (r=0.506, p<0.01) with financial performance. The research also revealed that market risk management was not being adequately led by experts, leading to potential gaps in risk mitigation. Based on these findings, the study recommended policy adjustments, improved communication, and proactive risk management strategies. The study emphasized the importance of continuous risk assessment frameworks to enhance the resilience of Rwandan commercial banks

and ensure sound investment decisions that align with long-term financial stability.

Igihozo and Irechukwu (2024) assessed the relationship between the project risk management process and the performance of the Mpazi Channel construction project in Nyabugogo, Kigali, Rwanda. The study aimed to evaluate how the risk management process affects the success of the project. A mixed-methods approach was adopted, with a sample of 118 respondents selected from a target population of 168, using stratified sampling and Sloven's formula. The data were analyzed using SPSS, applying descriptive statistics (mean and standard deviation) and inferential statistics (regression and correlation analysis). The results indicated a highly positive and significant relationship between project risk identification and project performance, with a correlation coefficient of 0.970 (p-value = 0.000), and between risk management strategy and project performance (r = 0.979, p-value = 0.000). Furthermore, the correlation between risk response planning and project performance was significant (r = 0.985, p-value = 0.000). The study concluded that risk management procedures play a critical role in the success of the Mpazi Channel construction project, accounting for 97.5% of the project's success. Based on these findings, the study recommended the formal and planned implementation of risk management procedures throughout the project lifecycle for key personnel, support staff, and laborers to enhance project performance.

Gichohi, Iravo, and Muchelule (2024) investigated the effect of project risk management on the performance of road construction projects in Kenya, with a focus on the moderating role of organizational culture. The study adopted a cross-sectional research design and positivist paradigm, analyzing road construction projects implemented by National Government road agencies (KURA, KeRRA, and KeNHA). The target population comprised 695 management employees involved in these projects, from which 248 respondents were selected using stratified random sampling. Data were collected through semi-structured questionnaires, pre-tested for reliability and validity, and analyzed using SPSS version 25. Descriptive statistics, correlation, and regression analysis were applied to test relationships between variables. Findings revealed that project risk management had a significant positive relationship with project performance, and organizational culture positively moderated this relationship. The study recommended prioritizing project risk management and organizational culture in road construction projects in Kenya.

Mugenga and Bugingo (2024) examined the impact of risk management on the performance of construction projects in Musanze District, Rwanda, focusing on the GS Kampanga Road and INES-Busogo project. The study targeted 600 employees from NPD Ltd., with a

sample of 86 respondents. Descriptive and inferential statistics were used, and Pearson correlation and multiple regression models were applied to analyze the data. The findings showed a positive correlation between risk management and project performance. The correlation coefficients for risk planning, avoidance, response, and mitigation were 0.661, 0.855, 0.867, and 0.934, respectively. While risk planning did not show statistical significance ($p = 0.197$), risk avoidance, response, and mitigation had significant impacts ($p = 0.007$, $p = 0.000$, and $p = 0.000$, respectively). The study concluded that involving Rwandan residents in construction projects could provide income opportunities and enhance personal economic growth.

Karera (2022) investigated the effect of risk management on the implementation of the Indoor Residual Spraying (IRS) Project in Rwanda. The study aimed to explore the effects of project risk identification, analysis, response planning, and monitoring and control on IRS project implementation. Descriptive and analytical research designs were used, with a sample size of 83 IRS employees. The findings revealed significant positive correlations between these risk management aspects and project implementation. Specifically, risk identification showed a moderate positive correlation and significant effect on implementation, while risk analysis had a weak positive correlation with significant impact. Risk response planning demonstrated a high positive correlation, and risk monitoring and control exhibited a strong positive correlation, both having significant effects on implementation. The study highlighted the importance of comprehensive risk management in ensuring successful project execution and recommended enhancing the tools for risk analysis through more stakeholder orientation.

Ouma, Sang, and Kinoti (2022) explored the impact of risk analysis as a risk management practice on project performance in Kenyan commercial banks, focusing on information technology (IT) projects. The study addressed a research gap by investigating the moderating effect of project complexity and the mediating effect of risk culture. The target population consisted of 40 IT projects across Kenyan commercial banks, with a sample size of 108 respondents. Data were collected via questionnaires, tested for reliability using Cronbach's alpha, and analyzed using SPSS version 25. Findings showed that risk analysis significantly effectd the performance of IT projects in the banking sector. The study recommended that banks operationalize risk analysis in IT projects and that the Central Bank of Kenya establish a risk policy framework to guide project management. This research contributes to improving the success rates of IT projects by providing statistical insights into risk management practices in Kenya's banking industry.

Megeid (2024) examined the effects of climate risk

disclosure on financial performance, financial reporting, and risk management in Egypt. The study focused on assessing the extent to which Egyptian enterprises disclose climate-related risks and how this disclosure impacts financial performance. Using regression models, the research analyzed both quantitative and qualitative data obtained from the financial statements of 25 publicly traded firms between 2019 and 2022. The findings showed a strong, positive correlation between the disclosure of climate-related risks and improved financial performance, financial reporting, and risk management practices. This suggests that accurate and comprehensive disclosure of climate risks plays a crucial role in helping firms manage financial and operational uncertainties posed by climate change. The research emphasized the need for firms to provide stakeholders with reliable information regarding the potential effects of climate change, including rising temperatures, climate-related regulations, and technological advancements. These disclosures help organizations respond effectively to emerging risks and opportunities in a rapidly evolving global environment.

Obondi (2022) explored the impact of project risk monitoring and control practices on project success in construction projects in the United States. The study focused on practices such as risk reassessment, risk audits, contingency reserves analysis, and risk status meetings. Data was collected from 50 construction project managers in the Dallas-Fort Worth area using an electronic survey, and Spearman rho correlation analysis was applied to assess the relationship. The study found that all risk monitoring and control practices were significantly and positively associated with project success. The research suggested further studies in developing countries to assess the generalizability of the findings. The study concluded that construction organizations should prioritize project risk monitoring and control to enhance project success.

3. Methodology

The research focused on project staff, including project managers, supervisors, finance staff, accountants, M&E employees, procurement officers, IT staff, and human resources personnel. The total study population comprised 133 participants. The study used a census inquiry approach as the population of the study found to be small, data were collected from all 133 participants. The study employed structured questionnaires and document reviews, integrating both qualitative and quantitative methods. A descriptive and correlational research design was applied, and data analysis was conducted using SPSS to examine the relationship

between project risk management practices and project performance.

The analysis of data incorporated descriptive statistics, inferential statistics (Bivariate Correlation analysis), and a linear regression model. SPSS (version 25.0) was used to examine factors such as frequency, percentage, mean, and standard deviation. Bivariate Correlation analysis assessed the validity of hypotheses by examining the relationship between a dependent variable and an independent variable.

To maintain ethical standards, full respect was given to participants' rights to autonomy, confidentiality, anonymity, and informed consent. Prior to participating in the surveys, individuals were asked for their consent, and all collected data remained confidential. The questionnaires did not ask for any personal identifiers such as names or titles, ensuring the anonymity of all respondents throughout the research process.

4. Results and Discussion

Regression analysis, confidence intervals, hypothesis testing, and correlation analysis are all examples of inferential statistics, which seek to derive inferences from statistical data. In this research, inferential statistics, including as hypothesis testing, correlation, and regression analysis, were used to investigate the connections between important variables and analyze their effect on the Rwanda Urban Development Project (RUDP) of REMA. The analysis was led by four possible hypotheses. Project risk identification has no significant effect on RUDP performance (H01). Project risk analysis has no substantial effect on RUDP's performance (H02). Project risk response planning had no significant effect on RUDP's performance (H03). Project risk monitoring and control had no meaningful effect on RUDP's performance (H04).

4.1 Correlation analysis

The correlation analysis examined the link between the study's independent and dependent variables. The researcher performed the Pearson correlation analysis, which is reported in Table 1 below.

Table 1: Correlation matrix

		Project risk identification	Project risk analysis	Project risk response planning	Project Risk Monitoring and Control	Project performance
Project risk identification	Pearson Correlation	1	.693**	.604**	.511**	.710**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	128	128	128	128	128
Project risk analysis	Pearson Correlation	.693**	1	.792**	.607**	.772**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	128	128	128	128	128
Project risk response planning	Pearson Correlation	.604**	.792**	1	.748**	.788**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	128	128	128	128	128
Project Risk Monitoring and Control	Pearson Correlation	.511**	.607**	.748**	1	.702**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	128	128	128	128	128
Project performance	Pearson Correlation	.710**	.772**	.788**	.702**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	128	128	128	128	128

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1 presents the correlation between project risk management practices and the performance of the Rwanda Urban Development Project. Project risk identification exhibits a strong positive correlation with project performance (r = 0.710), indicating a significant effect. Since correlation values between 0.7 and 1 denote a strong effect, this confirms that project risk identification enhances project performance. The findings are consistent with Irumva and Njenga (2023), who emphasized that effective project risk identification enhances performance outcomes. Their findings show

how systematic risk identification contributes to project success. Both studies highlight the critical role of identifying risks in improving project results.

Project risk analysis also shows a strong correlation (r = 0.772) with project performance, highlighting its role in reducing uncertainties. The findings resonate with Aikpokhio et al. (2024), who examined the effect of risk analysis on project performance. Their findings show how comprehensive risk analysis reduces uncertainties. Both studies highlight the importance of thorough risk assessment in achieving successful project outcomes.

Project risk response planning demonstrates a strong correlation (r = 0.788), emphasizing its importance in ensuring project success. The findings align with Simon and Mutiso (2022), who mentioned that proactive risk response planning significantly impacts project success. Their findings show how effective planning enhances project performance. Both studies highlight the necessity of comprehensive risk management strategies for successful project execution.

Similarly, project risk monitoring and control has a strong positive relationship with project performance (r = 0.702), confirming the necessity of continuous oversight in the Rwanda Urban Development Project. The significance values for all variables are 0.000, which is below the 0.05 threshold, confirming statistical significance. The findings are supported by Moura and Tomei (2021), who examined the significance of risk monitoring and control in projects. Their findings show how continuous oversight improves project outcomes. Both studies highlight the value of effective monitoring in achieving project success.

4.2 Regression analysis

The multiple regression analysis was used to evaluate the research hypotheses by determining the impact of independent factors on the dependent variable. It seeks to ascertain the degree to which a single dependent variable may be predicted using a collection of independent factors.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.862[a]	.742	.734	.34537	1.600

a. Predictors: (Constant), Project Risk Monitoring and Control, Project risk identification, Project risk analysis, Project risk response planning

b. Dependent Variable: Project performance

Source: Research findings, 2025

Table 2 presents the model summary for the regression analysis of project risk management practices on the performance of the Rwanda Urban Development Project. The R-value of 0.862 signifies a strong relationship between the independent variables and project performance, as values above 0.7 indicate a strong effect. The R-Square value of 0.742 indicates that 74.2% of the variations in project performance are explained through project risk identification, risk analysis, response planning, and monitoring and control. The significance value of 0.000, being below 0.05, confirms the statistical significance of the model. The Durbin-Watson value of 1.600 falls within the acceptable range of 1.5 to 2.5, indicating no serious autocorrelation concerns.

The findings are consistent with Ohaya (2022), who emphasized the importance of risk management in infrastructure projects. Their findings show how structured risk assessment frameworks improve project performance and accountability. The findings in the Rwanda Urban Development Project indicate a strong relationship between project risk management practices and performance, confirming the critical role of effective risk management strategies. Both studies highlight the necessity of addressing various risks to enhance the outcomes of urban development initiatives.

Table 3: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42.243	4	10.561	88.535	.000[b]
	Residual	14.672	123	.119		
	Total	56.915	127			

a. Dependent Variable: Project performance

b. Predictors: (Constant), Project Risk Monitoring and Control, Project risk identification, Project risk analysis, Project risk response planning

Source: Research findings, 2025

Table 3 presents the ANOVA results assessing the statistical significance of the regression model for the Rwanda Urban Development Project. The F-statistic of 88.535, which is considerably high, signifies that the independent variables significantly affect project performance. The significance level of 0.000, being below 0.05, confirms the statistical validity of the model. The findings are supported by Radeny *et al.* (2022), who emphasized that effective risk management is vital for the success of major development projects in East Africa. Their findings show how the effect of independent variables significantly impacts project performance. The findings in the Rwanda Urban Development Project indicate a strong statistical significance of the regression model, confirming the importance of addressing various risks. Both studies highlight the necessity of robust risk management practices to enhance successful infrastructure development in the region.

Table 4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.318	.172		1.844	.068		
	Project risk identification	.249	.059	.270	4.195	.000	.505	1.979
	Project risk analysis	.217	.078	.232	2.771	.006	.300	3.338
	Project risk response planning	.272	.086	.284	3.151	.002	.258	3.873
	Project Risk Monitoring and Control	.204	.067	.210	3.029	.003	.434	2.302

a. Dependent Variable: Project performance

Source: Research findings, 2025

Table 4 presents the regression coefficients, analyzing the specific effects of project risk management practices on the performance of the Rwanda Urban Development Project. The constant value of 0.318 (t = 1.844, p = 0.068) implies that when all project risk management practices remain at zero, project performance retains a baseline level of 0.318, though its significance is above 0.05.

A unit increase in project risk identification results in a 0.249 increase in project performance ($\beta = 0.249$, t = 4.195, p = 0.000), confirming its significance. The findings are consistent with Babrah and Irumba (2023), who examined the relationship between risk management practices and financial performance. Their findings show how effective risk identification contributes to financial success. Both studies highlight the critical importance of risk identification in enhancing project and organizational performance.

A unit increase in project risk analysis leads to a 0.217 increase in project performance ($\beta = 0.217$, t = 2.771, p = 0.006), reinforcing its role in reducing project uncertainties. The findings resonate with Oruru and Juma (2022), who explored the effect of risk response strategies on project completion. Their findings show how risk analysis significantly affects outcomes. Both studies highlight the necessity of comprehensive risk analysis in achieving successful project execution.

Project risk response planning contributes positively, with a unit increase leading to a 0.272 rise in project performance ($\beta = 0.272$, t = 3.151, p = 0.002), demonstrating its importance. Likewise, project risk monitoring and control positively impacts project performance. The findings in the Rwanda Urban Development Project align with Nzainga (2023), who analyzed the impact of risk response strategies on geothermal project performance. Their findings show how effective risk planning leads to improved project outcomes. Both studies highlight the role of strategic risk response in enhancing project success.

With a unit increase resulting in a 0.204 increase ($\beta = 0.204$, t = 3.029, p = 0.003). The findings supported by Maina and Mungai (2023), who explored the effects of risk monitoring on project performance in infrastructure developments. Their findings show how continuous risk monitoring contributes positively to project outcomes. Both studies highlight the importance of effective risk monitoring in achieving project success.

The collinearity statistics indicate that all tolerance values exceed 0.1 and all VIF values remain below 10, confirming the absence of multicollinearity. This ensures that the independent variables do not exhibit high intercorrelation, maintaining the reliability of the regression estimates in explaining the performance of the Rwanda Urban Development Project.

5. Conclusion and Recommendations

5.1 Conclusions

This study aimed to investigate the effect of project risk identification, project risk analysis, project risk response planning, and project risk monitoring & control on the performance of the Rwanda Urban Development Project. The analysis of these factors demonstrated significant relationships with project performance. For project risk identification, a positive and significant impact was observed on project performance (p<0.05), leading to the rejection of the null hypothesis. Similarly, project risk analysis was found to significantly affect project performance (p<0.05), resulting in the null hypothesis being rejected. Additionally, project risk response planning was shown to have a considerable effect on project performance (p<0.05), leading to the rejection of the null hypothesis. Furthermore, project risk monitoring and control was likewise found to significantly affect project performance (p<0.05), contributing to the rejection of the null hypothesis for this variable as well. These results emphasize the critical role of effective risk management processes in ensuring the success of the Rwanda Urban Development Project.

5.2 Recommendations

1. Project Managers should establish a detailed scope definition framework and ensure periodic reviews to minimize scope creep, enhancing the success of the Rwanda Urban Development Project.
2. Project Supervisors must ensure strict adherence to scope guidelines throughout execution to maintain project focus and prevent unnecessary modifications that could affect project timelines.
3. Project Finance Staff should conduct frequent financial audits to identify and mitigate budget variances, ensuring financial discipline and improving the success of the Rwanda Urban Development Project.

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