Effect of Project Risk Management Practices on Project Performance in Rwanda: A Case of Infection Disease (ID) and Maternal and Child Health (MCH) Project

ABSTRACT

The study titled "Effect of Project Risk Management Practices on Project Performance in Rwanda: A Case of Infection Disease (ID) Project and Maternal and Child Health (MCH) Project" provides valuable insights into the interplay between risk management and project success. The research involved a sample of 87 employees from both the ID and MCH projects, utilizing universal sampling for participant selection. Data was gathered through questionnaires and documentary reviews, effectively capturing relevant information. The analysis employed descriptive statistics and correlation analysis to assess relationships. Key findings revealed a moderate positive correlation ($r= 0.596$, p-value=0.000<0.01) between project risk management practices and the performance outcomes of both projects. This suggests that effective risk management contributes positively to project success. Additionally, the study identified a significant difference in project risk identification practices between the ID and MCH projects, with a mean value difference of 0.6381 and a p-value of 0.047, indicating that the risk identification approaches differ significantly at the 5% significance level. These findings underscore the crucial role of tailored risk management strategies in enhancing project performance, particularly in health-related initiatives. Integrating these insights can lead to improved outcomes in similar projects across Rwanda.

Keywords: Project; project risk management and project performance; Maternal and Child Health (MCH).

1. INTRODUCTION

The modern business environment is characterized by turbulence and fierce competition (Joslin and Müller (2015). This turbulence and competition are driven by factors such as globalization, technological advancements, more demanding customers, and increased uncertainty, all of which have made the management of organizations more complex than ever before (Goble and Bier (2013). In this increasingly competitive global landscape, the success of projects has become a critical factor in an organization's overall business performance. However, many projects continue to face delays, changes in scope, failures, and even cancellations (Raz, Shenhar, and Dvir (2002).

Project management plays a crucial role in the successful implementation of projects, including those involving Industry 4.0 technologies.

Despite the growing interest in integrating Industry 4.0 technologies into project management, there is still a gap in research regarding how critical success factors in these projects influence sustainability. Much of the existing literature focuses primarily on the qualifications and competencies of human resources as a success factor. Human resources are undeniably important, but there is a need to examine their role in the context of Industry 4.0 technologies and how they contribute to project sustainability (Widianti, Harihayati, and Sufaatin (2018).

A project is defined as a temporary endeavor with a clear start and end, aimed at achieving specific, unique goals and delivering value or a product (Widianti, Harihayati, and Sufaatin (2018).No project is free from risks; in fact, projects often encounter unforeseen risks. Therefore, achieving project success depends heavily on clear and effective risk management, from planning to completion. (Widianti, Harihayati, and Sufaatin (2018), (Borecki (2020).

Risk management is a systematic process of identifying, analyzing, and addressing risks, with the goal of maximizing the likelihood and impact of positive events while minimizing the probability and consequences of adverse ones Gupta (2013).Although risks cannot be entirely eliminated, they can be managed—through avoidance, acceptance, or transfer—depending on the nature and impact of the risk on the project's sustainability (Hopkin (2018).

Effective risk identification is a critical first step. This involves compiling a list of potential risks and understanding the various levels of impact associated with each one. Problems often arise when risk levels are misjudged or mitigation strategies are insufficiently developed (Hurst and Jee-Hughes (2001), (Bueno et al. (2016). These shortcomings can lead to increased project costs, delays, and deviations from the initial plan. As such, this study aims to assist project teams in implementing risk management practices by assessing the significance of risks, evaluating their potential impact, and developing appropriate mitigation strategies.

In many Eastern African countries, such as Kenya, projects face significant challenges, including delays, cost overruns, poor quality workmanship, and premature termination (Carvalho and Rabechini Junior (2015). These issues raise concerns about whether the government can deliver value for money to its citizens. In Rwanda, achieving economic prosperity is directly tied to the health and well-being of its citizens. According to WHO (Motaleb and Kishk (2014), health is defined as a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity. The Sustainable Development Goals (SDGs), particularly those related to health, have driven international organizations to invest in projects aimed at improving health outcomes. However, despite some improvements, studies have shown that many health-related projects in Rwanda face sustainability challenges, with fewer projects remaining operational after completion (Nyatanyi et al. (2017).

These challenges are often exacerbated by a lack of proper risk analysis and the absence of concrete risk management strategies during project design. Additionally, many projects fail to adequately address contextual factors, such as infrastructure and financial constraints, which can lead to unsustainable outcomes.

The aim of this study is to analyze the impact of project risk management practices on project performance in Rwanda, specifically focusing on Infection Disease (ID) and Maternal and Child Health (MCH) projects. By examining these projects, the study seeks to identify how effective risk management practices can improve project outcomes and contribute to the sustainability of health initiatives in Rwanda.

2. REVIEW OF LITERATURE

This section reviews practical studies conducted by various scholars on the effect of project risk management on project performance.

(Salleh (2015) conducted a study on risk management perceptions and trends in the U.S. construction industry. The study adopted a survey research design and found that, in recent years, contractors have become more willing to assume risks related to contractual and legal problems by sharing risks with the project owner. These risks include issues like change-order negotiations, third-party delays, contract delays, and indemnification clauses. The survey also revealed that contractors are now assuming the risks associated with actual quantities of work, which marked a significant departure from earlier findings by the American Society of Civil Engineers (ASCE). According to (Aduma and Kimutai 2018), when risks cannot be avoided or transferred, the best strategy is to accept the risk and manage it to minimize its impact. In this case, risk acceptance involves acknowledging

the risk and taking a calculated approach—either by allocating appropriate contingency plans or by actively monitoring the risk.
(Ghahramanzadeh 2013) conducted a study on managing risks in construction projects in Iran. Using a descriptive research design, the study identified 25 key risks, which were categorized into five primary groups. The research also assessed the criticality of these risks and the effectiveness of proposed mitigation strategies, which were evaluated through 100 surveys distributed to key project stakeholders, including customers, contractors, and consultants. Out of 76 valid responses, 24 participants were interviewed to explore how these groups handle the identified risks. The findings highlighted that economic and financial risks had the greatest impact on construction projects in Iran.

(Figueiredo and Kitson (2009) examined risk and contingency management in pipeline projects, employing a survey research design. Their study found that to avoid risks entirely, one would have to abandon the entire project. However, this is often unnecessary, as risk avoidance can be achieved by altering the project design or strategy to circumvent unacceptable risks. For instance, project objectives may be adjusted by extending the timeline, reducing the scope, or modifying the project approach to minimize negative risk impacts. The study also discussed risk transfer, noting that while it does not eliminate the risk, it shifts the responsibility for managing and responding to risks to other parties involved in the project (Project Management Institute (2015).

(Wabomba 2015) studied the influence of risk management strategies on project performance through a survey of selected Nairobi-based international development organizations. The study aimed to determine the correlation between various risk response strategies and project duration. It concluded that there is a need to raise awareness about risk management practices, especially for low-uncertainty projects. The study also suggested that new tools and methods for risk management should be developed and tested to improve project performance and success.

(Aimable 2015) investigated the effects of risk management methods on project performance in the Rwandan construction industry, focusing on a case study of the RSSB multi-storey building project. The study found that the use of appropriate risk management methods, such as risk avoidance, risk transfer, and risk retention, was strongly correlated with project performance. These methods were mainly applied in the program phase by the client, in the planning phase by both the client and the consultant, and in the procurement and production phases by the contractor. The study suggested that the procurement phase should play a more significant role in joint risk management and that risk management strategies should be based on a shared understanding of the risks and responsibilities among the project stakeholders (Alshammari, Yahya, and Haron (2020).

The research conducted by [(Mavitiru (2022) Mavitiru, (Alphonse and Valens (2023) Alphonse & Valens highlighted that project success is measured by the realization of intended objectives, as well as the perception and satisfaction of the project's end-users and key participants (Khang and Moe (2008). Khang and Moe argued that modern project success models link traditional project objectives with long-term outcomes. Similarly, (Dai and Wells 2004) emphasized that proper implementation of project management practices leads to greater project benefits. However, they also noted that high project failure rates persist, which has prompted project practitioners to seek effective solutions through conferences, training, and workshops organized within performing organizations.

3. RESEARCH METHODOLOGY

This study adopted a descriptive research design and case study approach. According to (Orodho 2003) a descriptive research design is appropriate when collecting information through interviews or surveys administered to a sample of individuals. Additionally, d(u Plooy and Du Plooy 2009)assert that a case study design is valuable for gaining deeper insight and understanding the relationship between two research variables.

In this study, both questionnaires and interviews were employed to gather data, providing a comprehensive understanding of the influence of project management practices on the success of the project.

The study population consisted of 87 employees from Partners In Health, working across two projects: 40 employees from the Infectious Disease (ID) project and 47 employees from the Maternal and Child Health (MCH) project. The sample size was determined using Slovin’s formula, as follows:

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

Where:

n = required sample size
N = known population size
e = level of significance (usually set at 0.05)

For this study, N = 87 and e = 0.05. Given the relatively small target population, purposive sampling was employed to select participants for the study. This sampling technique was chosen to ensure that participants with relevant experience and knowledge of the projects were included.

3.1 Data Analysis

This study utilized descriptive statistical methods to represent and summarize the biographical data. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to present and discuss the findings. To analyze the relationship between project risk management practices and project performance, Multiple Linear Regression (MLR) was employed. The analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 23.0 and STATA 13.0.

Multiple Linear Regression was chosen to predict how project risk management practices influence project performance, particularly in the context of the Infectious Disease (ID) Project and the Maternal and Child Health (MCH) Project in Rwanda. The following model, adapted from previous studies examining risk management strategies and their impact on project performance, was used in the current study:

$$Y = \beta 0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_{3+}\beta_4 x_{4+}\beta_5 x_{5+}e$$

Where:

Y = Project performance
β0 = Intercept (constant)
β1, β2, β3, β4, β5 = Coefficients representing the independent variables
X1 = Project risk identification
X2 = Project risk assessment and analysis
X3 = Risk prioritization
X4 = Planning for risk response
X5 = Project risk monitoring and control
e = Error term, assumed to be normally distributed with a mean of zero and constant variance.

For the qualitative data, content analysis was employed. This involved organizing the data into categories, coding, and sorting responses to identify patterns and interpret meanings.Saunders et al. (2009) argue that content analysis allows researchers to categorize information and organize it into themes, making it easier to interpret the findings. The qualitative data were presented in narrative form, with inferences drawn based on the identified patterns.

4. RESULTS AND DISCUSSION

4.1 Profile of Respondents

The profile of the respondents was considered important, as their ability to provide relevant and accurate information on the study variables is influenced by their background. The study evaluated the respondents' profiles in terms of the following key factors: gender, age, educational qualification, job position, and years of experience within the company. These factors were assessed to understand how they might impact their perspectives and contributions to the study.

4.2 Gender Distribution

The study aimed to assess the gender distribution of respondents and therefore requested participants to indicate their gender. The results revealed that the majority of employees in the ID project were male, with 57.5% of respondents identifying as males, compared to 42.5% who were female. Similarly, in the MCH project, 51.1% of employees were male, while 48.9% were female. This demonstrates that both genders were involved in the study, indicating that gender bias was not a concern in the findings. The study further noted that the slight difference in gender distribution could be attributed to the fact that a higher number of males were employed in the private companies selected for the study. Overall, more males participated in the ID and MCH projects compared to females.

4.3 Educational Qualification

Respondents were asked to indicate their highest level of education. The findings revealed that the majority of employees in both projects had obtained a Bachelor's degree: 67.5% in the ID project and 69% in the MCH project. Regarding other educational levels, 20% of employees in the ID project held a Diploma, whereas 14.9% of

MCH project employees had a Diploma. A smaller percentage of respondents had Master's degrees, with 2.5% in the ID project and 8.5% in the MCH project. Very few respondents had secondary education, with only 5% in the ID project and 4.3% in the MCH project. Only 2.5% of respondents in the ID project and 2.1% in the MCH project held a PhD. These results indicate that most of the participants had higher education, particularly Bachelor's degrees, which suggests that they were knowledgeable and capable of understanding and applying risk management strategies effectively. This educated workforce is likely well-positioned to contribute to the success of the projects through informed decision-making.

4.4 Age Distribution

The study found that the majority of employees in both the ID and MCH projects were between the ages of 31 and 40 years, with 45% in the ID project and 42.6% in the MCH project. The second largest group in the MCH project (36.4%) fell into the 41-50 age range, while 30% of ID project employees were between 20 and 30 years old. These findings indicate that both projects employed a relatively young workforce, which could positively influence the adoption and application of risk management strategies, enhancing project performance. It is important to note that no respondents were aged over 50 or below 20, which may suggest an age limit within the projects or a selection bias favoring middle-aged and younger workers. The age distribution also reflects a team that is likely to understand and contribute to discussions on the relationship between risk management and project performance.

4.5 Work Experience

In terms of work experience, the study revealed that 72.5% of employees in the ID project had between 5 and 8 years of experience, with 15% having less than 5 years of experience. In the MCH project, 65.5% of employees had 5 to 8 years of experience, and 21.8% had more than 8 years of experience. These findings suggest that the respondents had substantial work experience, making them well-qualified to provide insights into risk management practices and their impact on project performance. Their experience suggests a solid understanding of how project operations are managed, which is critical for ensuring that risk management strategies are implemented effectively. These findings are consistent with research by (Hoxha and McMahan 2018) which concluded that a project manager's experience significantly influences project success. Therefore, the experience of the respondents in this study plays a crucial role in understanding and applying risk management techniques to improve project outcomes.

4.6 Relationship between Project Risk Management and Performance of ID & MCH Projects

This section explores the relationship between project risk management strategies and the performance of the ID and MCH projects. To achieve this objective, the study employed two key analytical methods: correlation analysis and multiple linear regression analysis. These methods were used to assess the strength and nature of the relationship between the various risk management strategies and project performance outcomes.

The Pearson correlation was used to examine the relationship between risk management strategies and the performance of ID and MCH projects. The results revealed a moderate positive correlation between project risk management and the performance of both MCH and ID projects ($r = 0.596$, p-value = 0.000, which is less than 0.01). This correlation was statistically significant at the 1% significance level, indicating a strong positive relationship between risk management strategies and project performance. In other words, as risk management practices are more frequently employed, the performance of ID and MCH projects tends to improve.

These findings align with the results of a previous study by (Ernst & Young 2012) which found that projects with more mature risk management practices tend to achieve better results and greater project sustainability. Similarly, the results are consistent with a study by (Aon Risk Solutions and the Wharton School 2011), which revealed a positive relationship between the maturity of an organization's risk management framework and its performance.

4.7 Multiple Linear Regression Model (MLRM)

Regression analysis was conducted to examine the relationship between account receivable management practices and the performance of ID and MCH projects, specifically evaluating the contribution of project risk management practices

such as risk identification, risk assessment and analysis, risk prioritization, planning for risk response, and monitoring and control. The regression models were tested to determine their significance. Statistical significance was assessed using the coefficient (β), t-statistic, and p-value. Relationships between the dependent and independent variables were considered statistically significant at the 5% significance level. The analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 26.0, to compute the multiple regression measurements for the study.

The results show that the correlation coefficient (R) is 0.596, R-squared is 0.355, and the adjusted R-squared is 0.315. R-squared, also known as the coefficient of determination, indicates how much the performance of ID and MCH projects is explained by project risk management practices, including risk identification, risk assessment and analysis, risk prioritization, planning for risk response, and monitoring and control. An R-squared value of 0.355 means that 35.5% of the variation in project performance can be explained by these five risk management practices. The remaining 64.5% of the performance variation is influenced by other factors not included in the model.

As shown in the table, the p value obtained is 0.000 which is less than 0.05. This implies that the model developed can be relied for prediction. At 95% confidence level therefore, there is significant relationship between account receivable management practices and performance of ID and MCH projects. This implies that the model can be used for prediction purposes.

The equation ($Y = \beta 0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_{3+}\beta_4 x_{4+}\beta_5 x_5+ e$) becomes:

Performance of ID and MCH project=49.23+0.596 Project risk identification+ 0.519Project risk analysis + 0.318Project risk ranking+ 0.089 Project planning risk responses+ 0.584 Project risk monitoring. The regression equation above has established that taking all factors into account (project risk identification, project risk assessment and analysis, risk prioritization, planning for risk response and monitoring & control) constant at zero. Performance of ID and MCH projects will be 49.23. This implies that there is others variables apart from project risk management contributing 49.23 to performance of ID and MCH projects and also statistically significant because p-value of those variable equal to 0.000 which is less than 0.05.

Table 1. Profile of respondents

		Name of project					
		ID project		MCH project		Total	
		fi	%	fi	%	fi	%
Gender	Males	23	57.5	24	51.1	47	54.0
	Females	17	42.5	23	48.9	40	46.0
	Total	40	100.0	47	100.0	87	100.0
Education level	Secondary	2	5.0	2	4.3	4	4.6
	Diploma	8	20.0	7	14.9	15	17.2
	Bachelors' degree	27	67.5	33	70.2	60	69.0
	Masters	2	5.0	4	8.5	6	6.9
	PhD	1	2.5	1	2.1	2	2.3
	Total	40	100.0	47	100.0	87	100.0
Age group	Between 20 and 30 years	12	30.0	7	14.9	19	21.8
	Between 31and 40 years	18	45.0	20	42.6	38	43.7
	Between 41and 50 years	9	22.5	17	36.2	26	29.9
	Age above 50 years	1	2.5	3	6.4	4	4.6
	Total	40	100.0	47	100.0	87	100.0
Working experience	Below 5 years	6	15.0	5	10.6	11	12.6
	Between 5 and 8 years	29	72.5	28	59.6	57	65.5
	Above 8 years	5	12.5	14	29.8	19	21.8
	Total	40	100.0	47	100.0	87	100.0

Source: Primary data, 2023

Table 2. Correlations coefficients of this study

		Project risk management	Performance of ID and MCH projects
Project risk management	Pearson Correlation	1	.596**
	Sig. (2-tailed)		.000
	N	87	87
Performance of ID and MCH projects	Pearson Correlation	.596a**	1
	Sig. (2-tailed)	.000	
	N	87	87
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 3. Model Summary of this study

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.596[a]	.355	.315	5.75779
a. Predictors: (Constant), Project risk monitoring, Project risk responses, Project risk analysis, Project risk ranking, Project risk identification				

Table 4. ANOVA of this study

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1476.265	5	295.253	8.906	.000[b]
	Residual	2685.321	81	33.152		
	Total	4161.586	86			
a. Dependent Variable: Performance of ID and MCH projects						
b. Predictors: (Constant), Project risk monitoring, Project risk responses, Project risk analysis, Project risk ranking, Project risk identification						

Regression of coefficients results in Table 5, shows that there is a positive and significant relationship between project risk identification and performance of ID and MCH projects as supported by a p value of 0.000 and a beta coefficient of 0.596. This show that an increase of one unit of project risk identification leading to an increase of 0.596 in performance of ID and MCH projects. The regression of coefficients results in Table 5, shows that there is a positive and significant relationship between project risk analysis and performance of ID and MCH projects as supported by a p value of 0.030 which is less than 0.05 level of significant and a beta coefficient of 0.519. This show that an increase of one unit of project risk analysis leading to an increase of 0.519 in performance of ID and MCH projects.

The regression of coefficients results in Table 5, shows that there is a positive and insignificant relationship between project risk ranking and performance of ID and MCH projects as supported by a p value of 0.242 which is great than 0.05 level of significant and a beta coefficient of 0.318. This show that an increase of one unit of project risk ranking leading to an increase of 0.318 in performance of ID and MCH projects but not statistically significant.The regression of coefficients results in Table 4 shows that there is a positive and significant relationship between project risk responses and performance of ID and MCH projects as supported by a p value of 0.020 which is less than 0.05 level of significant and a beta coefficient of 0.089. This show that an increase of one unit of project risk responses leading to an increase of 0.089 in performance of ID and MCH projects. From the study findings it was apparent that there existed statistically significant relationship between risk avoidance and performance of projects, this was clearly indicated by utilization of various techniques in the effort to avoid risks including use of contingency plans, implementation of safety systems, use of work plans in execution of

projects and utilization of regular inspections to ensure no eventuality occurs that may affect the performance of project. Risk avoidance also exhibited positive correlation with project performance. The regression of coefficients results in Table 5, shows that there is a positive and significant relationship between project risk monitoring and performance of ID and MCH projects as supported by a p value of 0.000 which is less than 0.05 level of significant and a beta coefficient of 0.584. This show that an increase of one unit of project risk monitoring leading to an increase of 0.584 in performance of ID and MCH projects.

According to the study, majority of respondents strongly agreed that ID and MCH project had adopted various risk management practices in their risk management efforts. This could, therefore, explain why most of projects had continued to be financially viable for longer periods. With regard to the various risk management practices adopted by projects, the study found that risk identification contributes the most to the performance of project implemented by Partners in Health followed by risk analysis, risk management program implementation & monitoring and risk assessment & measurement in that order. At 5% level of significance and 95% level of confidence, risk identification, analysis, monitoring and risk assessment & measurement all significantly influenced the performance of project implemented by Partners in health. The finding concurred with (Zwikael and Ahn (2011) who also established that project risk management strategies, even when moderated, had a positive relationship with levels of project risk strategies and project success.

Table 5. Regression coefficients of this study

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	49.23	7.825		6.292	.000
Project risk identification(X1)	.596	.158	.491	3.768	.000
Project risk analysis(X2)	.519	.235	.272	2.211	.030
Project risk ranking(x_3)	.318	.270	.112	1.179	.242
Project risk responses(X4)	.089	.156	.057	2.570	.020
Project risk monitoring(X5)	.584	.130	.421	4.482	.000

a. Dependent Variable: Performance of ID and MCH projects

5. CONCLUSION

This study concludes that effective risk management practices in ID and MCH projects, implemented by Partners in Health, lead to improved project performance. The correlation analysis of the study variables confirmed this relationship. The positive beta coefficients in the regression analysis further indicate that an increase in any of the risk management practices results in positive outcomes for ID and MCH projects. Specifically, the practices of project risk identification, risk assessment and analysis, risk prioritization, planning for risk response, and monitoring and control were found to have the greatest impact on project performance. Each Rwandan franc invested in these risk management practices contributes positively to the success of ID and MCH projects.

Given these findings, it is crucial to allocate more resources and focus on strengthening risk management practices to enhance project success and sustainability. The study also established a significant positive correlation between risk management practices and project performance, further reinforcing the importance of these practices.

6. RECOMMENDATIONS

1. Project managers should view risk management not as a routine task, but as a critical tool for effective and efficient project execution.
2. All project team members should understand the importance of risk management and be aware of how frequently it should be conducted, depending on the nature of the project.
3. Emphasis should be placed on enhancing risk management during the project identification phase, as it has a significant positive impact on project performance.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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