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EFFECT OF PROJECT RISK MANAGEMENT ON THE SUCCESS OF WATER SUPPLY PROJECTS IN RWANDA. A CASE OF NYABIHU DISTRICT

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ABSTRACT

The main objective of the research is to assess the effects of project risk management on the success of water supply projects in Rwanda. The specific objectives of the research are: to evaluate the effects of project risk identification on the success of water supply projects in Rwanda, to find out the effects of project risk analysis on the success of water supply projects in Rwanda, to determine the effects of project risk response on the success of water supply projects in Rwanda and to define the effects of project risk monitoring and control on the success of water supply projects in Rwanda. Therefore, our population is comprised of 174 persons. The respondents include project managers, engineers, technicians, District and WASAC staff, Sector land, infrastructure and settlement officer (Sector level), Cell economic development officer (Cell level), water users and project funders. Slovin's formula for determining sample size: This provides a sample size of 121 for the population of 174 with an assumption of 5% as a level of precision level for purposive sampling survey. Among the available methods in collecting data two methods were used. These are literature review and questionnaires. The researcher used Statistical Package for Social Science (SPSS) to analyze primary data that were collected from the questionnaires. R-square in this study is 0.635 means that any change on success of water supply projects is explained by project risk identification at 63.5%. R-square in this study is 0.405 means that any change on success of water supply projects is explained by project risk analysis at 40.5%. R-square in this study is 0.640 means that any change on success of water supply projects is explained by project risk response at 64.0%. R-square in this study is 0.502 means that any change on success of water supply projects is explained by project risk monitoring and control at 50.2%. According to the findings of this research project, a formal and structured risk management practice should be implemented during project planning, with the participation of all project stakeholders.

Key Words: Project risk management, risk identification, risk analysis, risk response, risk monitoring and control and project success

INTRODUCTION

Statement of the problem

Several studies revealed the relationship between project risk management and projects performance of water projects. Shenhar and Dvir (2010) demonstrated that adopting risk management practices has a significant impact on the success of water projects. They also show a positive impact from the presence of a risk manager on project performance. From the practical point of view, paying attention to uncertainties during the project, making use of the risk management techniques and deeply understand the business environment are critical success factors, demanding attention of project managers and risk managers. According to these authors much of the risk in projects comes from uncertainty, but there are other factors that contribute to project risk, for example, the timeframes and deadlines, costs, scarcity of resources, inadequate abilities and competencies, among others.

Government of Rwanda though its entities and partners undertook a different water projects aiming at boosting and ensuring clean water for all Rwandans. Investments in the WASH sector have been increasing steadily in nominal terms over the past years (UNICEF, WASH Budget Brief: Investing in water and sanitation for child welfare in Rwanda , 2018). Despite the efforts by all players in the water industry, many water projects in Rwanda run a high risk poor performance by being well over budget and significantly late. Water supply goals set in Rwanda national strategies defined in EDPRS II, vision 2050 and NST1 aiming at universal improved water services for all Rwandans by 2024 were recognized as unachievable (UNICEF, 2019). Water project in Rwanda has a reputation for time and cost overruns. One of the reasons of the bad performance is that the construction industry is one of riskiest of all business types (Clough, Sears, & Sears, 2005). While some degree of poor cost and time schedule performance is inevitable in construction projects, it is possible to improve risk management strategies to minimize their negative impact and thus improve the project performance.

Even the same cases are inherent in infrastructures projects regarding water supply implemented under Public Private Partnership contract in Rwanda. The contractor performance in water supply projects in Rwanda is influenced by the project scope changes, technical design, costs estimation, projects funding policies, project planning and procurement processes (RPPA, 2014). To the owner of the water supply projects, the contractor performance means successful or failure of contractor to accomplish contracting works. Rwanda launches different water supply projects throughout the country to improve people wealth through water and sanitation services. The most water supply projects face the problem of delay and poor performance of contractors during the execution period (WASAC Report, 2018).

It is undeniable that risk management contributes effectively to the performance of water infrastructure projects as proved by enormous studies above. Nevertheless, infrastructure projects are vulnerable due to many risks as proved by several authors Hwang Kwak & La Place,(2005),De Brux, (2010).This implies that the performance of water projects require adequate management of risks that is barely affordable as they display a huge debt ratio which is a prevailing risk as asserted by (Zhang, 2005).

Objectives of the study

The main objective of the research is to assess the effects of project risk management on the success of water supply projects in Rwanda.

The specific objectives of the research are:

- ✓ To evaluate the effects of project risk identification on the success of water supply projects in Rwanda.
- ✓ To find out the effects of project risk analysis on the success of water supply projects in Rwanda.
- ✓ To determine the effects of project risk response on the success of water supply projects in Rwanda.
- ✓ To define the effects of project risk monitoring and control on the success of water supply projects in Rwanda.

Research hypothesis

1. Project risk identification has statistically significant effect on success of water supply project in Rwanda.
2. Project risk analysis has statistically significant effect on success of water supply projects in Rwanda.
3. Project risk response has statistically significant effect on the success of water supply project in Rwanda.
4. Project risk monitoring and control have statistically significant effect on the success of water supply project in Rwanda.

LITERATURE REVIEW

The chapter covers the main themes that are conceptual, theoretical literature, theoretical framework and empirical literature on project risk management and the performance of water supply projects.

Risk management for water schemes

Risk management in the water sector has traditionally been reactive, rather than proactive (Allan et al. 2013a), and risks have been over or under exaggerated, dependent on their nature (Luis 2014). Procedures pertaining to environmental and public health risk management have proliferated to the point where resources have been focused on preventing historical incidents, rather than addressing risks which may arise in the future (MacGillivray and Pollard 2008, Luis 2014). Business risks have received inadequate attention (Institute for Sustainable Futures 2013c), largely owing to the historic public monopoly of water utilities (Pollard 2008). While economic regulation is in place, and water industry competition has been promoted in some areas, this has created further unintended business risks (Productivity Commission 2011, Allan et al. 2013a).

Risks identification

Risk identification is the first step of the risk management process. In order to manage risk, an organization needs to know what risks it faces. This helps to determine the risks that might affect the project and document their characteristics. The identification of risk can be separated into initial and continuous risk identification. Initial identification is for new projects or activity within an organization for which the risks have not been identified. Continuous risk identification is for ongoing project in order to identify new risks which did not previously arise, changes in existing risks

in the course of the project, or risks which did exist ceasing to be relevant to the organization (HM, 2004).

These findings are similar to the findings by Fageha(20 14) that effective needs identification leads to clear project scope definition which can alleviate the risks of inadequate project planning and inadequate design that can lead to expensive changes during construction, delays, rework, cost overruns, schedule overruns, and project failure.

Wang & Huang (2013) a project has many stakeholders beyond the project team boundaries and whose interest could be related or in conflict, the needs identification process at the early stage with the input from all stakeholders is vital to the project success.

Risk analysis and assessment

Risk analysis is the process that figures out how likely that a risk will arise in a project. It studies uncertainty and how it would impact the project in terms of schedule, quality and costs if in fact it was to show up. Two ways to analyze risk is quantitative and qualitative. Risk analysis and assessment. Before ranking the risks, it is time to make an analysis and an assessment of them. This is the second step of a standard risk management, through which the reasons why the given risks should be taken care of and what are the possible aftermaths if the risks become real things are given.(Kloosterman, 2016).

Project risks prioritization: In risk prioritization, the organization determines which combinations of probability and impact result in a classification of high risk (red condition), moderate risks and low risks (PMI, 2004). Prioritizing risks serves as guide to risk response because it points out the risk that requires much attention and those that can just be kept under watch by the organization. The highest priority risks should be given regular attention at the highest level of organization (Jutte, 2014).

Walliman (2011) In other words, if the risk has significant impact on the project, the best solution is to avoid it by changing the scope of the project or, worst scenario, cancel it. There are many potential risks that a project can be exposed to, and which can impact its success.

Risks response

Four main risk response measures are found in the literature. Though these strategies are referred to differently in literature, the most common nomenclature used for these response strategies are: risk avoidance, risk reduction, risk transfer and risk acceptance (Flanagan et al, 2006). Risk avoidance deals with the risks by changing the project plan or finding methods to eliminate the risks such as adopting a different technology or terminating the project. Risk reduction aims at reducing the probability and/or consequences of a risk event. Those risks that remain in the project after risk avoidance and reduction may be transferred to another party either inside or outside the project. Risk retention or acceptance indicates that the risk remains present in the project (Osipova, 2008).

Different studies have reported variations in the adoption of these response measures. For instance, risk reduction has been identified as the most frequently used technique within the construction industry in Sweden, while risk transfer is the most preferable strategy among the UK practitioners (Akintoye et al,2008).

The implementation of these response strategies requires proper monitoring to ensure there is no deviation from the original plan. Risk monitoring and control is a process of identifying, analyzing,

and planning for newly arising risks, keeping track of the identified risks and those on the watch list, reanalyzing existing risks, monitoring trigger conditions for contingency plans, monitoring residual risks, and reviewing the execution of risk responses while evaluating their effectiveness (PMI, 2004). The purpose of this stage is to determine if: project assumptions are still valid, risks as assessed has changed, proper risk management policies and procedures are being followed. These become necessary so as ensure the successful implementation of the project with a guarantee degree of success (PMI, 2004).

Risk review and monitoring

In case when potential risks have been addressed, there is a final imperative called risk assessment and monitoring. This is how the feasibility and validity of the solutions or strategies mentioned above to manage the risks in the fourth step (risk treatment) are assessed. After the strategies are implemented, the solutions can be improved; while at the same time, new risks may be discovered. Newly discovered risks can be re-resolved through the 5-step risk management process (Kloosterman,2016).

Performance of water supply projects

The risks that have been recognized in water supply projects are dominated by the quality of drinking water produced. Hrudey et al. (2006) showed that the dangerous factor in the water sector is the failure to offer safe drinking water for the needy. In fact, many cases of microbial and chemical contamination in drinking water were recorded and they have caused diseases and many deceases. This has lead water actors to continually monitor water quality by diminishing the risk of pollution in drinking water supplies (Hamilton et al., 2006). In addition, risk management is needed not only in the context of ensuring safe drinking water, but also in maximizing the availability, serviceability and life of their assets and minimizing expenditures on energy, chemicals, and processes (Hrudey et al., 2006). Therefore, risk management should be applied to the entire drinking water supply process, starting from the catchment, treatment, distribution, and ending at the customer plumbing system.

Moreover, other two studies conducted in domain of projects risk management and project performance in water supply projects Ozorho,(2007) and Yamo (2006), proved a strong relationship between project risk management and project performance in PPP but they didn't highlight risk management process in water supply projects.

Theoretical review

Project risk management is one of the core issues in ensuring water supply project's success. The subject of risk management has been studied by several researchers and a variety of risk management models with different numbers of stages can be found in the literature.

Expected Value

Expected Value was one of the first theories of decision-making under risk. The expected value model did not consider the fact that the value that a particular payoff held for one person was not directly related to its precise monetary worth (Tversky & Kahneman, 1979). Bernoulli introduced the concept of systematic bias in decision-making. Bernoulli assumed that people tried to maximize their utility and not their expected value(Tversky & Kahneman, 1979). In Von Neumann and Morgenstern's model of subjective utility, one person may not share the same utility curve as another, but each follows the same normative axiom in striving toward their individually defined maximum subjective utility (Neumann & Morgenstern, 1953).

Prospect theory

Prospect theory is a theory of decision-making under conditions of risk (Tversky & Kahneman, 1979). Decisions involve internal conflict over value trade-offs. This theory is designed to better describe, explain, and predict the choices that typical person makes in a world of uncertainty. The theory addresses how these choices are framed and evaluated in the decision making process. Prospect theory advances the notion that utility curves differ in domains of gain from those in domains of loss. Prospect theory is designed to explain a common pattern of choice. It is descriptive and empirical in nature. Prospect Theory looks at two parts of decision making: the editing, or framing, phase, and the evaluation phase (Tversky, 1967).

Framing refers to the way in which a choice, or an option can be affected by the order or manner in which it is presented to a decision maker. The evaluation phase of a prospect theory encompasses two parts, the value function and the weighting function. The value function is defined in terms of gains and losses relative to the reference point not in terms of absolute wealth. In prospect theory, value is a function of change with a focus on the starting point so that the change is either negative or positive. Prospect theory predicts that domain affects risk propensity. Losses have more emotional impact than an equivalent amount of gains and therefore weighted more heavily in our decision- making (Tversky & Kahneman, 1975). In making a decision, a decision maker multiplies the value of each outcome by its decision weight. Decision weights do not serve solely as measures of perceived likelihood of an outcome but also represent an empirically derived assessment of how people actually arrive at their sense of likelihood. An important function of weighting function is that low probabilities are overweighed while high and medium probabilities are subjectively underweighted (Tversky & Kahneman, 1979).

Conceptual framework

The theme under study is divided into two categories: the independent and dependent variables. Independent subtheme is project risk management with its respective subthemes that include project risk identification, project risk analysis, project risk response, project risk monitoring and control. Dependent variable consists of project performance and its respective indicators including timeliness, budget, end product specifications, and stakeholder expectations. For the purpose of this research, the independent and dependent variables and sub-variables are shown in the following figure which depicts a pictorial representation on assess project risk management and the performance of water projects. The sub variables risks management including risks identification, risks analysis, risk response and risk monitoring were also the common aspects pointed out by several empirical reviews presented in this study. The researcher replicated them in this study.

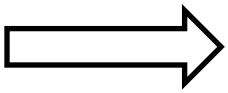

Figure 1: Conceptual framework (Source: Researcher compilation 2021)

RESEARCH METHODOLOGY

The research attempts to predict, correlate effects of project risk management with project performance. The research has a cross- sectional design, which involves getting views of respondents or informants at one point in time.

Population is the study object, which may be individuals, groups, organizations, human and events, or the conditions to which they are exposed Welman and Kruger (2000). In Nyabihu District, there are 6 ongoing or recent completed water projects. Each water project is usually made of client, funders, contractor, supervisor and beneficiaries. Client is normally WASAC ltd or Nyabihu District. There are also project funders and big water users (who consume more than 20 m3 per Month) who influence the implementation of the project. There are also big water users. Therefore, our population is comprised of 174 persons as shown in the table below.

Table 1: Population Distribution

Types of respondent	**Total Population**	**Sample size**	**Percentage**
Nyabihu District)	**3**	**3**	**100%**
WASAC ltd	**4**	**4**	**100%**
Contractor	18	18	100%
Supervisor	12	12	100%
Big water users	50	40	80%
Project funders	**2**	**2**	**100%**
Sector land, infrastructure and settlement officer (Sector)	12	12	100%
Cell economic development officer (Cell)	**73**	**30**	**47%**
Total Population	**174**	**121**	**60%**

The researcher has adopted purposive sampling for selecting the respondents. The main purpose is to select a respondent who comprehend effectively with risk management of water projects implemented or influenced by their organizations. To determine the sample size, the researcher selected 121 respondents from client, contractor supervisor, local authorities and water users from the target population of 174 key personnel working on or influencing six ongoing or recent completed water projects in Nyabihu by applying Slovin's formula as follows:

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

Where

N: total population

n: number of sample

e: error of tolerance

This provides a sample size of 121 for the population of 174 with an assumption of 5% as a level of precision level for purposive sampling survey;

Among the available methods in collecting data two methods were used. These are literature review and questionnaires. Literature was reviewed to establish what others have documented on the

subject matter. Useful secondary information was collected from seminar and workshop papers, journal papers and Internet sources.

The researcher used Statistical Package for Social Science (SPSS) to analyze primary data that were collected from the questionnaires. The model that was used is interpretation of data by frequencies that display the frequencies and percentage frequency. As a descriptive study the researcher applied descriptive statistics such as mean and standard deviation. The tool of correlation analysis was developed to study and measure the statistical relationship that exists between project risk management and water project performance by indicating the strength and closeness of the relationship between projects risk management and the performance of water supply projects.

FINDINGS

This chapter represents the presentation, analysis and interpretation of primary data collected from the respondents regarding project risk management and the performance of water supply projects in Rwanda.

Project risk identification

This sub-section refers to presentation, analysis and interpretation of primary data collected on the course of this study regarding the effects of project risk identification on the success of water supply projects in Nyabihu District.

Table 2: Project risk identification

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	S.D
Objectives, program, and standards related to risk management	4	8	12	48	49	4.07	1.03
	3.3%	6.6%	9.9%	39.7%	40.5%		
Standard and process for risk identification and process improvement	3	9	10	55	44	4.05	.98
	2.5%	7.4%	8.3%	45.5%	36.4%		
List of risks and uncertainties that may affect the achievement of objectives	3	9	18	46	45	4.00	1.02
	2.5%	7.4%	14.9%	38.0%	37.2%		
Different activities and possible risks from them.	0	11	6	64	40	4.09	.86
	0.0%	9.1%	5.0%	52.9%	33.1%		
Involvement of external stakeholders and professionals in risk identification.	0	11	11	20	79	4.38	.98
	0.0%	9.1%	9.1%	16.5%	65.3%		

Source: Research findings 2021

The results in Table 2 showed respondents views on project risk identification of water supply projects in Nyabihu District; 3.3% strongly disagree, 6.6% disagree, 9.9% were neutral, 39.7% agree and 40.5% strongly agree that there is objectives, program, and standards related to risk management, With descriptive statistics of Mean =4.07and SD=1.03 this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 2.5% strongly disagree, 7.4% disagree, 8.3% were neutral, 45.5% agree and 36.4% strongly agree that there is standard and process for risk identification and process improvement, With descriptive statistics of Mean =4.05 and SD=0.98this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 2.5% strongly disagree, 7.4% disagree, 14.9% were neutral, 38.0% agree and 37.2% strongly agree that there is list

of risks and uncertainties that may affect the achievement of objectives, With descriptive statistics of Mean =4.00 and SD=1.02 shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 9.1% disagree, 5.0% were neutral, 52.9% agree and 33.1% strongly agree that there is different activities and possible risks from them, With descriptive statistics of Mean =4.09 and SD=0.86 shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. 9.1% disagree, 9.1% were neutral, 16.5% agree and 65.3% strongly agree that there is involvement of external stakeholders and professionals in risk identification, With descriptive statistics of Mean =4.38 and SD=0.98 shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses.

The findings show that the majority of respondents agree and strongly on the statement regarding the effects of project risk identification on the success of water supply projects in Nyabihu District.

This is in agreement with study conducted by HM (2004) stated that risk identification is the first step of the risk management process. In order to manage risk, an organization needs to know what risks it faces. This helps to determine the risks that might affect the project and document their characteristics. The identification of risk can be separated into initial and continuous risk identification. Initial identification is for new projects or activity within an organization for which the risks have not been identified. Continuous risk identification is for ongoing project in order to identify new risks which did not previously arise, changes in existing risks in the course of the project, or risks which did exist ceasing to be relevant to the organization.

These findings are similar to the findings by Fageha(20 14) that effective needs identification leads to clear project scope definition which can alleviate the risks of inadequate project planning and inadequate design that can lead to expensive changes during construction, delays, rework, cost overruns, schedule overruns, and project failure.

Table 3: Correlation between project risk identification and success of water supply projects

		Project risk identification	Success of water supply projects
Project risk identification	Pearson Correlation	1	.797**
	Sig. (2-tailed)		.000
	N	121	121
Success of water supply projects	Pearson Correlation	.797**	1
	Sig. (2-tailed)	.000	
	N	121	121

Source: Research findings 2021

Correlation Table 3 shows that project risk identification strongly correlates with success of water supply projects in Nyabihu District: Pearson correlation of 0.797 with a p value of 0.000, which is less than 0.05. This indicates that the relationship between project risk identification and success of water supply projects is significant, implying that having project risk identification has the potential to strengthening success of water supply projects in Nyabihu District.

Table 4: Model Summary on project risk identification and success of water supply projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.797[a]	.635	.632	1.51179

a. Predictors: (Constant), Project risk identification

Source: Research findings 2021

Table 4 shows the value of R-square in this study is 0.635 means that any change on success of water

supply projects (dependent variable) is explained by the independent variable (project risk identification) at 63.5%. This indicates that the model is reasonable, as the independent variable moderately describes the dependent variable. R coefficient of 0.797 indicates a strong positive relationship project risk identification and success of water supply projects in Nyabihu District.

Project Risk analysis

This sub-section refers to presentation, analysis and interpretation of primary data collected on the course of this study regarding the effects of project risk analysis on the success of water supply projects in Nyabihu District.

Table 5: Project risk analysis

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	S.D
Determination of risk consequences and their likelihood.	7	26	8	14	66	3.87	1.41
	5.8%	21.5%	6.6%	11.6%	54.5%		
Comparison of levels of risk found and risk criteria established	8	9	12	42	50	3.96	1.18
	6.6%	7.4%	9.9%	34.7%	41.3%		
Consideration of existing controls, their effectiveness and efficiency.	9	0	19	48	45	3.99	1.09
	7.4%	0.0%	15.7%	39.7%	37.2%		
Collection, storage and processing of risk analysis information	3	5	4	35	74	4.42	.92
	2.5%	4.1%	3.3%	28.9%	61.2%		
Updating and validation of norms and assumptions assumed.	7	4	13	31	66	4.19	1.13
	5.8%	3.3%	10.7%	25.6%	54.5%		

Source: Research findings 2021

The results in Table 5 showed respondents views on project risk analysis of water supply projects in Nyabihu District; 5.8% strongly disagree, 21.5%disagree, 6.6% were neutral, 11.6% agree and 54.5% strongly agree that there is determination of risk consequences and their likelihood., With descriptive statistics of Mean =3.87and SD=1.41 this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 6.6%strongly disagree, 7.4%disagree, 9.9%were neutral, 34.7% agree and 41.3% strongly agree that there is comparison of levels of risk found and risk criteria established, With descriptive statistics of Mean =3.96 and SD=1.18 this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses.

The results show that 7.4%strongly disagree, 15.7% were neutral, 39.7% agree and 37.2% strongly agree that there is comparison of levels of risk found and risk criteria established, With descriptive statistics of Mean =3.99 and SD=1.09this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses.

The results show that 2.5% strongly disagree, 4.1% disagree, 3.3% were neutral, 28.9% agree and 61.2% strongly agree that there is collection, storage and processing of risk analysis information, With descriptive statistics of Mean =4.42 and SD=0.92 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses.

The results show that 5.8% strongly disagree, 3.3% disagree, 10.7% were neutral, 25.6% agree and 54.5% strongly agree that there is updating and validation of norms and assumptions assumed, With descriptive statistics of Mean =4.19 and SD=1.13this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses.

The findings show that the majority of respondents agree and strongly on the statement regarding the effects of project risk analysis on the success of water supply projects in Nyabihu District.

The findings supported by Kloosterman (2016) described that risk analysis is the process that figures out how likely that a risk will arise in a project. It studies uncertainty and how it would impact the project in terms of schedule, quality and costs if in fact it was to show up. Two ways to analyze risk is quantitative and qualitative. Risk analysis and assessment. Before ranking the risks, it is time to make an analysis and an assessment of them. This is the second step of a standard risk management, through which the reasons why the given risks should be taken care of and what are the possible aftermaths if the risks become real things are given.

Table 6: Correlation between Project risk analysis and success of water supply projects

		Project risk analysis	Success of water supply projects
Project risk analysis	Pearson Correlation	1	.636**
	Sig. (2-tailed)		.000
	N	121	121
Success of water supply projects	Pearson Correlation	.636**	1
	Sig. (2-tailed)	.000	
	N	121	121

Source: Research findings 2021

Correlation Table 6 shows that project risk analysis moderately correlates with success of water supply projects in Nyabihu District: Pearson correlation of 0.636 with a p value of 0.000, which is less than 0.05. This indicates that the relationship between project risk analysis and success of water supply projects is significant, implying that having project risk analysis has the potential to strengthening success of water supply projects in Nyabihu District.

Table 7: Model Summary on Project risk analysis and success of water supply projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.636[a]	.405	.400	1.93109

a. Predictors: (Constant), Project risk analysis

Source: Research findings 2021

Table 7 shows the value of R-square in this study is 0.405 means that any change on success of water supply projects (dependent variable) is explained by the independent variable (project risk analysis) at 40.5%. This indicates that the model is tolerable, as the independent variable moderately describes the dependent variable. R coefficient of 0.636 indicates a moderate positive relationship project risk analysis and success of water supply projects in Nyabihu District.

Risk response

This sub-section refers to presentation, analysis and interpretation of primary data collected on the course of this study regarding the effects of project risk response on the success of water supply projects in Nyabihu Distrct.

Table 8: Project risk response

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	S.D
Selection of risk strategies (e.g. avoid, retain, reduce or transfer) based on output from risk analysis and evaluation.	6	0	2	33	80	4.49	.94
	5.0%	0.0%	1.7%	27.3%	66.1%		
Measurement of effectiveness and efficiency of the controls established.	4	0	12	53	52	4.23	.88
	3.3%	0.0%	9.9%	43.8%	43.0%		
Consideration of stakeholders perceptions in risk treatment selection	2	0	8	59	52	4.31	.74
	1.7%	0.0%	6.6%	48.8%	43.0%		
Establishment of indicators to track the progress of risk response	12	0	6	43	60	4.14	1.19
	9.9%	0.0%	5.0%	35.5%	49.6%		
Risk response strategies are implemented in light of risk analysis output	8	3	6	38	66	4.24	1.11
	6.6%	2.5%	5.0%	31.4%	54.5%		

Source: Research findings 2021

The results in Table 8 showed respondents views on project risk response of water supply projects in Nyabihu District; 5.0%strongly disagree, 1.7% were neutral, 27.3% agree and 66.1% strongly agree that there is Selection of risk strategies (e.g. avoid, retain, reduce or transfer) based on output from risk analysis and evaluation, With descriptive statistics of Mean =4.49 and SD=0.94 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses. The results show that 3.3% strongly disagree, 9.9% were neutral, 43.8% agree and 43.0% strongly agree that there is measurement of effectiveness and efficiency of the controls established, With descriptive statistics of Mean = 4.23 and SD=0.88 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses. The results show that 1.7% strongly disagree, 6.6% were neutral, 48.8% agree and 43.0% strongly agree that there is consideration of stakeholders perceptions in risk treatment selection, With descriptive statistics of Mean = 4.31 and SD=0.74 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses. The results show that 9.9% strongly disagree, 5.0% were neutral, 35.5% agree and 49.6% strongly agree that there is establishment of indicators to track the progress of risk response, With descriptive statistics of Mean = 4.14 and SD=1.19 this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 6.6%strongly disagree, 2.5% disagree, 5.0% were neutral, 31.4% agree and 54.5% strongly agree that risk response strategies are implemented in light of risk analysis output, With descriptive statistics of Mean = 4.24 and SD= 1.11 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses.

The findings are not far for Akintoye et al, (2008) have reported variations in the adoption of these response measures. For instance, risk reduction has been identified as the most frequently used

technique within the construction industry in Sweden, while risk transfer is the most preferable strategy among the UK practitioners.

The findings show that the majority of respondents agree and strongly on the statement regarding the effects of project risk response on the success of water supply projects in Nyabihu Distrct.
Walewski et al. (2013) as a result, many believe that the Risk Response Planning phase is the most important in the risk process, since this is where the project team gets a chance to make a difference to the risk exposure facing the project.

Table 9: Correlation between Project risk response and success of water supply projects

		Project risk response	Success of water supply projects
Project risk response	Pearson Correlation	1	.800**
	Sig. (2-tailed)		.000
	N	121	121
Success of water supply projects	Pearson Correlation	.800**	1
	Sig. (2-tailed)	.000	
	N	121	121

Source: Research findings 2021

Correlation Table 9 shows that project risk response strongly correlates with success of water supply projects in Nyabihu District: Pearson correlation of 0.80 with a p value of 0.000, which is less than 0.05. This indicates that the relationship between project risk response and success of water supply projects is significant, implying that having project risk response has the potential to strengthening success of water supply projects in Nyabihu District.

Table 10: Model Summary on Project risk response and success of water supply projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800[a]	.640	.637	1.50216

a. Predictors: (Constant), Project risk response
Source: Research findings 2021

Table 10 shows the value of R-square in this study is 0.640 means that any change on success of water supply projects (dependent variable) is explained by the independent variable (project risk response) at 64.0%. This indicates that the model is adequate, as the independent variable moderately describes the dependent variable. R coefficient of 0.80 indicates a strong positive relationship project risk response and success of water supply projects in Nyabihu District.

Risk monitoring and control

This sub-section refers to presentation, analysis and interpretation of primary data collected on the course of this study regarding the effects of project risk monitoring and control on the success of water supply projects in Nyabihu District.

Table 11: Project risk monitoring and control

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**S.D**

Formal monitoring process and controls with the consideration of feedback from stakeholders and experts.	2	2	10	67	40	4.19	.72
	1.7%	1.7%	8.3%	55.4%	33.1%		
Assurance of external support (experts) and top management in the implementation of the risk management program.	6	3	18	42	52	4.14	1.01
	5.0%	2.5%	14.9%	34.7%	43.0%		
Assurance of data / reporting requirements for effective risk management and decision makers are assured	2	3	15	56	45	4.19	.75
	1.7%	2.5%	12.3%	46.3%	37.2%		
Definition and implementation of a strategy for the management of change.	3	4	2	59	53	4.42	.73
	2.5%	3.3%	1.7%	48.8%	43.8%		
Regular audits are carried out.	3	2	8	32	76	4.55	.69
	2.5%	1.7%	6.6%	26.4%	62.8%		

Source: Research findings 2021

The results in Table 11 showed respondents views on project risk monitoring and control of water supply projects in Nyabihu District; 1.7% strongly disagree, 1.7% disagree, 8.3% were neutral, 55.4% agree and 33.1% strongly agree that there is formal monitoring process and controls with the consideration of feedback from stakeholders and experts, With descriptive statistics of Mean =4.19 and SD=0.72this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 5.0% strongly disagree, 2.5% strongly disagree, 14.9% were neutral, 34.7% agree and 43.0% strongly agree that there is assurance of external support (experts) and top management in the implementation of the risk management program, With descriptive statistics of Mean = 4.14 and SD=1.01 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses. The results show that 1.7% strongly disagree, 2.5% strongly disagree, 12.3% were neutral, 46.3% agree and 37.2% strongly agree that there is assurance of data / reporting requirements for effective risk management and decision makers are assured, With descriptive statistics of Mean = 4.19 and SD=0.75 this shows that there is high mean and it is evidence of the existence of the fact and heterogeneity of responses. The results show that 2.5% strongly disagree, 3.3% strongly disagree, 1.7% were neutral, 48.8% agree and 43.8% strongly agree that there is definition and implementation of a strategy for the management of change, With descriptive statistics of Mean = 4.42 and SD=0.73 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses. The results show that 2.5% strongly disagree, 1.7% strongly disagree, 6.6% were neutral, 26.4% agree and 62.8% strongly agree that there is regular audits are carried out, With descriptive statistics of Mean = 4.55 and SD=0.69 this shows that there is very high mean and it is strong evidence of the existence of the fact and heterogeneity of responses.

The findings show that the majority of respondents agree and strongly on the statement regarding the effects of project risk monitoring and control on the success of water supply projects in Nyabihu District.

Kloosterman (2016) in case when potential risks have been addressed, there is a final imperative called risk assessment and monitoring, This is how the feasibility and validity of the solutions or strategies mentioned above to manage the risks in the fourth step (risk treatment) are assessed. After the strategies are implemented, the solutions can be improved; while at the same time, new

risks may be discovered. Newly discovered risks can be re-resolved through the 5-step risk management process.

Table 12: Correlation between project risk monitoring and control and success of water supply projects

		Project risk monitoring and control	Success of water supply projects
Project risk monitoring and control	Pearson Correlation	1	.750**
	Sig. (2-tailed)		.000
	N	121	121
Success of water supply projects	Pearson Correlation	.750**	1
	Sig. (2-tailed)	.000	
	N	121	121

Source: Research findings 2021

Correlation Table 12 shows that project risk monitoring and control strongly correlates with success of water supply projects in Nyabihu District: Pearson correlation of 0.75 with a p value of 0.000, which is less than 0.05. This indicates that the relationship between project risk monitoring and control and success of water supply projects is significant, implying that having project risk monitoring and control has the potential to strengthening success of water supply projects in Nyabihu District.

CONCLUSIONS AND RECOMMENDATIONS

The findings indicated that the variable project risk identification is good predictor of success of water supply projects, hereby the alternative hypothesis of the study is confirmed: H1: Project risk identification has statistically significant effect on success of water supply project in Nyabihu District The findings indicated that the variable project risk analysis is good predictor of success of water supply projects, hereby the alternative hypothesis of the study is confirmed: H2: Project risk analysis has statistically significant effect on success of water supply projects in Nyabihu District. The findings indicated that the variable project risk response is good predictor of success of water supply projects, hereby the alternative hypothesis of the study is confirmed: H3: Project risk response has statistically significant effect on the success of water supply project in Nyabihu District. The findings indicated that the variable project risk monitoring and control is good predictor of success of water supply projects, hereby the alternative hypothesis of the study is confirmed: H4: Project risk monitoring and control have statistically significant effect on success of water supply project in Nyabihu District.

Recommendation

- According to the findings of this research project, a formal and structured risk management practice should be implemented during project planning, with the participation of all project stakeholders.
- This research also suggests that qualified project managers be included in all stages of a project, including the needs analysis and identification, as well as the provisional funding and project scheduling stages.

Further researches

In Rwanda, more research is needed into the factors that influence the performance of social and political projects.

The findings of this research project suggest that additional research be conducted on the difficulties faced by developers in the development of budgets and schedules for water supply projects in Rwanda.

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