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PROJECT RISK MANAGEMENT AND THE PERFORMANCE OF PUBLIC PRIVATE PARTNERSHIP IN INFRASTRUCTURE PROJECTS

A CASE STUDY OF SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 2016-2019

RESEARCH PROJECT SUBMITTED TO UNIVERSITY OF RWANDAIN PARTIAL FULIFILMENT OF THE REQUIREMENT FOR AWARD OF MASTER IN BUSINESS ADMINISTRATION (MBA).

By

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MAY, 2021

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or for any other award

NDUNGUTSE INGABIRE Nicole

Sign _____ Date _____

I confirm that the work reported in this thesis was carried out by the candidate under my supervision

Name:

Sign _____ Date _____

DEDICATION

This study is dedicated to the all mighty God and my family due to their support and encouragement.

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ABSTRACT

This study sought to investigate project risk management and project performance, to explore risks facing infrastructures projects implemented by WASAC, to identify the project risk management strategies applied by WASAC and to establish a relationship between risks management and projects performance of WASAC with a specific reference of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of Japan International Cooperation Agency (JICA) in Rwanda. The researcher used the questionnaire, guided interview and documentary technique to collect data. The questionnaire was given to 76 respondents employees of WASAC and JICA selected from a total population of 315employees, documentary technique was used to collect secondary data from texbooks,journals,internets, guided interview was administrated to the project implementers that were selected JICA. To analyze the relationship between project risk management and project performance, mean, standard deviation and Pearson correlation was applied. To interpret the data collected from guided interview, the researcher applied content analysis method and narrative method analysis. Researcher found that SUS WATER&SANITATION project experienced several risks that were effectively managed to contribute to the project success and proved by the data collected from the respondents. However due to the fact that the project was implemented under the umbrella of three parties, there had been a gap for meeting the time scope that led to supplementary budget and the cost overrun of the project that justify why the respondents asserted that the project was success at moderate level as the corresponding mean is 3.98.The study revealed that there is significant correlation between risks management and water supply project performance As the rule of thumb asserts that significant correlation between two variables should be ranked between 0 to 0.5 and the P-value indicated in the are 0.000 and 000. On the basis of the findings, the researcher declared that the hypothesis of the study stipulating that there is a relationship between project risks management and project performance is verified and confirmed. On the basis of findings, the researcher suggests WASAC Rwanda, to enhance the capacity of risks management inherent to the water supply infrastructure projects and to effectively design water supply projects to avoid such unexpected tasks and supplementary capital expenditure.

Key words: Project risk management and Project performance.

CHAPTER ONE

GENERAL INTRODUCTION

1.1. Background to the study

Risk management is one of the most important components of project management, as unmanaged risks are one of the primary reasons of project failure (Chou and Pramudawardhani ,2015).A review of previous studies on risk management showed that there has been a noteworthy increase of knowledge and application of risk management over the past two decades. For instance, Taroun (2014) found that risk management is one of the topics with the highest rate of occurrence in key project management publications. Generally, risk management involves making a thorough investigation of the facts and risks that may have significant consequences on project objectives before making any decisions.

The principle behind risk management is to minimize unfortunate effects by identifying and controlling threats and maximize opportunities (Iqbal et al. 2015). Moreover, accurate risk identification can help to modify the probability of risk occurrence. It is important to understand that risk management is not responsible for completely eliminating all risks in the project. To manage a risk, it first needs to be identified through a risk identification process (Zavadskas et al. 2010). Due to the nature of the industry, each project involves some degree of risk. Although all potential risks need to be identified, efforts should focus on the most significant risks. Thus, risk identification should be conducted as part of a project's initial definition process, along with project planning, budgeting, and scheduling. In fact, these other activities cannot be conducted realistically without taking risk into consideration. In some cases, risk identification leads to project cancellation or major modifications during the initial planning stage (Calgary, 2008).

Projects carried out under a public-private partnership contract involve more inherent risks than the traditional procurement method due to the participation of many actors with different interests, in addition to economic and political conditions. Social and cultural in which the projects are developed, that is to say the traditional sources of risk. These risks associated with plant protection products must be studied and managed. Risk management is therefore a necessary condition for the success of PPP projects which have been designated as riskier

than traditionally acquired projects. This analysis has led to numerous studies in the field of risk management (Carbonara et al, 2011).

Zhang ((2009) argued that public-private partnerships (PPPs) provide an innovative procurement model to deliver public infrastructure by the private sector through contractual relationships between the public and private sectors. The public partner, hereinafter referred to as the government, has needs for new infrastructure, and then grants a concession to the private sector, hereinafter referred to as the contractor, to finance, design, build, and operate an infrastructure project. The government supervises and regulates the concession through contracts and regulations. Meanwhile, the contractor provides relevant services/products according to the specifications and receives payments from the end users or the government itself. At the end of the concession, the contractor transfers the concession and the project assets to the government.

Public private partnership (PPP) in developing countries has become increasingly popular as a way of involving the private sector in the development of public infrastructures (Javed et al. 2013). The special characteristics of PPP are competitive bidding processes, private sector innovation and expertise, and risk sharing between public and private sectors (Cheung and Chan 2011). On the other hand, a PPP project has a higher risk profile compared with traditional delivery because of long lead time, high capital expenditures, and long-lived assets with little value in alternative uses (Chan et al. 2015). In addition, the problems and challenges of the construction industry, particularly in PPP projects, are more complex and fundamental in developing countries compared to developed countries (Halaing et al. 2008).

It is well understood that PPP is a form of joint venture between government and private entities aimed at social and commercial objectives through cooperation, which includes risk sharing of estimated cost and expected returns (Loosemore and Cheung 2015). However, the differences in interests, corporate culture, and risk perception of the involved parties lead to disparate approaches and tools for dealing with risk (Liu et al. 2018).

1.2. Problem statement

Several studies revealed the relationship between project risk management and projects performance of infrastructure projects. Shenhar and Dvir (2010), demonstrate that adopting risk management practices has a significant positive impact on the success of infrastructure

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.

Another stream of work on project risk management carried out by PMI (2008) and other bodies of knowledge focus on the practical aspects, in which the risk management processes and tools become important from the point of view of its applications to the project performance. In the same context, Bakker et al. (2012) argued the importance of risk identification as the most influential process on project performance in terms of numbers as well as in the strength of communications effects, followed by risk reporting, risk registration and risk allocation, risk analysis, and finally risk control.

Nevertheless, (Marques & Berg, 2011) asserted that public private partnership projects suffer from numerous risks as demonstrated by several studies. Today, infrastructure investments depend heavily upon private capital markets for financing and on private firms for managerial expertise. Moreover; project financing is more risky than traditional corporate financing in delivering infrastructure projects. One reason is that the leverage level of project financing is usually much higher than that of corporate financing. The equity invested by contractors is their long-term commitment to project lenders, and the higher it is, the lower the risk level is. However, for most PPP infrastructure projects, the debt ratio is higher than 50% (Pantelias & Zhang, 2010).

PPP infrastructure projects are usually vulnerable to risks due to several reasons. First, PPP contracts are too complicated and incomplete, and thus it is impossible to cover all the risks in the clauses (De Brux, 2010). In addition, many risks in PPP infrastructure projects are very difficult to be precisely assessed due to large project scales and long durations. For instance, underestimation of demand shortfall is quite normal in traffic projects (Cruz & Marques, 2013). Thus, stakeholders could overestimate their capability of taking risks. The risk appetite of the project manager determines the risk transfer from the government (Kwak & La Place, 2005).

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 PPP 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 PPP 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).

A debt ratio have been a root of poor management that led to failure of infrastructure projects of WASAC as they faced the problem of delay and poor performance of contractors during the execution period in 2018.In the same context, WASAC undertook a large scale project:"SUS WATER AND SANITATION" aiming at boosting the amount of water in Kigali and semi urban areas. Taking into account of the risks WASAC experienced on the course of former implemented projects, the researcher got curious of the implementation of the project as it was designed and implemented in partnership of WASAC and Japan International corporation. Thus, the researcher is prompted to investigate the risks that specifically hinder SUS WATER AND SANITATION project and subsequent management strategies.

1.3. Research objectives

1.3.1. General objective

The general objective of this study is to investigate the impact of risk management on the projects performance in public private partnership.

1.3.2. Specific objectives

1. To explore risks facing infrastructures projects implemented by WASAC
2. To investigate the project risk management strategies applied by WASAC
3. To examine a relationship between risks management and projects performance of WASAC

1.4. Research questions

In order to address the above objective, the researcher analyzed the risk management and the performance of SUS WATER AND SANITATION Project by putting forward various questions aimed at testing different aspects of risk management and project performance.

i. What are the risks that hinder infrastructures projects implemented by WASAC?
ii. What are the project risk management strategies applied by WASAC?
iii. Is there a relationship between project risk management and performance of SUS WATER AND SANITATION Project?

1.5. Research hypothesis

This study was carried out on the basis of two hypothesizes to clarify the significance and relationship between the two variables of the study that are project risk management and the performance of WASAC project under stusy.Thus,on the course of this research, the following hypothesis were formulated.

H_0: There is a relationship between project risk management and project performance implemented by WASAC

H_1: There is no relationship between project risk management and project performance implemented by WASAC

1.6. Significance of the study

1.6.1. The researcher

This study aims at giving an idea to the researcher whether of project risk management contribute positively on the performance of projects in public private partnership. It will enable also the researcher to fulfill the requirements of Master in Business Administration.

1.6.2. Management of WASAC

The study will help the management of Water and Sanitation Corporation (WASAC) due to the facts that the findings of the study should be replicated to improve projects risk management to enhance the performance of water supply projects implemented by WASAC in Rwanda

1.6.3. Private contactors

As the study emphasizes on project risk management in the field of public private partnership, private contractors intend to benefit from this study as they implement multiple projects involving Water supply projects managed by WASAC

1.6.3. Future researchers

The study also provided material to researchers and academicians. This will be a basis for future academic studies as a source of secondary data in the field of project risk management and project performance.

1.7. Justification of the study

The inspiration that prompted the researcher to conduct this study project is based on the fact that many water supply projects managed by WASAC exerted enormous barriers including projects delay due to schedules that require agreement between public institutions and private contractors. Thus, the researcher got prompted to investigate project risk management and project performance with a specific reference of WASAC by considering a project that was recently implemented by WASAC in partnership with Japan International Cooperation Agency (JICA)

1.8. Organisation of the study

The research project report is organized into five chapters: Chapter one refers to the general introduction which covers the background of the study, the problem statement, the research objectives, research questions, the scope of the study, significance of the study and organization of the study. Chapter two presents the related literature review with reference to different source of data, especially from text books, reports and internet. Major areas that were covered are theoretical literature and empirical literature of project risk management and project performance, thereafter, critical literature and gap identification was also presented.

The third chapter presents the research methodology of this study, the research design, the data collection methods, and data analysis tools. Chapter four presents analysis and interpretation of the research data with regard to the research questions of the study. Chapter five summarized the research findings; give related recommendations and conclusions for further research.

CHAPTER TWO

THEORETICAL LITERATURE

2.0. Introduction

This chapter explores and critically analyses the literature of the main themes of the research to establish effective and clear understanding on project risk management and water infrastructure projects performance implemented in the structure of public private partnership. The chapter is structured in main sections covering the main themes that are theoretical literature, theoretical framework and empirical literature on project risk management and the performance of PPP infrastructure projects.

2.1. Theoretical literature

2.1.1. Public private Partnership

As the study project risk management in Public private partnership (PPP).It is self-explanatory that project risk management and project performance of this theoretical literature are highlighted in the context of PPP.Thus, in this subsection, the researcher has presented PPP by emphasising on the nature and collaboration, categories and projects risks associated with PPP infrastructure projects.

2.1.1 1.Collaboration in PPP

In a typical PPP program, the public sector part performs some or all of a government's service functions and assumes the associated risks for a significant period of time in return for financial benefits compensation according to predetermined performance criteria(Republic of Ghana, 2011). As argued by (Pessoa, 2006),usually these partnerships are based on the principles of comparative advantage, as the PPP recognizes that there are some activities where the public sector is best and others where the private sector has more to offer The overall aim of PPP is to structure the relationship between the public and private sectors in such a way that the risks associated with the specification, delivery and regulation of public services are allocated to the best party able to management them.

This is because P3s, like other construction activities, are not without risk. These risks are huge and will have a huge effect on project objectives if not addressed properly. The general

process of dealing with identifying risks and responding to risks in a project is called risk management. It is one of the most critical project management practices and it is directly linked to the success of a project. Effective risk management is about balancing risks and opportunities; it is a formal process continuously monitored, integrated into a formal process of defining objectives, identifying sources of uncertainties, analyzing these uncertainties and formulating management responses to find a balance acceptable between risk and opportunity (Thevendran & Mawdesley, 2004).

2.1.1.2. Structure of Public Private Partnership (PPP)

The PPP structure comprises of numerous variables depending on the need and complexity of the project. Regardless of the complexity, the structure of any PPP arrangement is significantly influenced or shaped by its model or contract type (Carbonara et al., 2011). The most relevant classification has been explained extensively, that is, user-pays versus government-pays PPPs. This and other variations and types of PPPs that consider other factors (ownership, scope, and so on) are shown below in an organized manner, presenting the PPP types depending on specific factors. Source of funds for the private partner´s revenues: user-pays PPPs (mainly based on charges to users) versus government-pays PPPs (mainly based on government payments for the service).Ownership of the PPP company or Special Purpose Vehicle (SPV): There are conventional PPPs (100 percent private ownership), institutional PPPs (publicly owned with 100 percent public ownership or under a JV or mixed scheme with the public party controlling the PPP company. Scope of the contract and/or object of the contract: Infrastructure PPPs or PPPs that include significant capital investment, where the main objective is developing and managing infrastructure over the long term; integrated PPPs when, in addition to the infrastructure, the private party is granted the right and obligation to operate a service when there is neither capital investment nor development of new infrastructure by the private partner.

2.1.1.3. PPP categories

On the basis of the degree of legal requirements, the European Commission (2004) allocated PPPs into contractual PPPs, concession PPPs and institutional PPPs. Contractual PPPs are more regulated in nature by law and are subject to detailed community regulation. They are based on a classic principal-agent relationship defined in a contract.

The public party pays the private party a monthly, quarterly or annual unit fee for the service, building or infrastructure over the term of the long-term contract. Another important determinant of the PPP structure is the aspect of project finance. It therefore becomes necessary to evaluate funding structures to determine the funding combinations used in PPP arrangements (Carbonara et al., 2011).

Basically, one of the goals of PPPs is to integrate the financial and management skills of the private sector into the provision of facilities and services traditionally provided by the public sector. Financial elements include sources of finance, interest rates, capital structure, repayments and deadlines, currency of loans and payments (Li, Akinyoye and Hardcastle, 2000). The financing structure can be provided by equity, debt financing, or a combination of both. The two extreme cases of PPP financing are total equity financing and total debt financing. In general, PPP projects are financed by a combination of the two, with different ratios between equity and debt. Usually, debt financing is above 70% (Carbonara et al., 2011).

2.1.1.4. Operating environment for PPP

An effective PPP program requires an enabling environment to ensure that production costs and public restrictions are brought down to sustainable levels. The operational environment includes at least two essential elements: the presence of anti-corruption laws and mechanisms (Yang, Hou and Wang, 2013) which go back to the legal and institutional frameworks that regulate the functioning of PPP agreements.

PPP projects present other structures that are a complex two-step procedure for selecting the private partner by prequalifying and setting requirements for the experience of financing PPP projects, the qualification of the private partner in a specific area, the experience in the implementation of similar projects, etc. At the same time, during the implementation of the PPP project, events may arise, associated with changes in the structure of the project company (private partner) and therefore the private partner will not meet these requirements. This could have a negative effect on the PPP project. In some respects, the contracting authority may fear that the original members of the bidding consortium will remain engaged throughout the duration of the project and that effective control of the project activities will not be transferred to entities unknown to the contracting authority. Contracting authorities are concerned if the shareholders of the concessionaire are entirely free to transfer their

investment in a particular project, there is no certainty as to who will actually provide the relevant services. (UNCITRAL, 2001).

PPP in the water sector "involves transferring some or all of the 'assets and operations' of public water systems into private hands (Wang, 2013),. This definition implies the basic characteristics of PPP, including ultimate public sector ownership and responsibility of water assets, risk allocation and responsibilities between public and private sectors, contribution of resources (financial, technology and human), and existence of a 'partnership'(HM Treasury, 1997). A partnership style approach to infrastructure and services delivery is seen as a key element in PPP(World Bank, 2003), prompting National Audit Office (NAO, 2001) to suggest that tightly specified contracts should have some flexibility in order to sustain contractual relationships in a spirit of partnership. This requires that public-private parties share a common vision of how best to work together in a project (NAO, 2001).

In water sector, the execution of PPP project require the transfer of the assets as planned operations from the public responsibilities to the private sector that is able to perform adequately designed projects on behalf of both involved parties. (Wang, 2013). In this context, World Bank report extended that the structure of PPPs project is of paramount importance, including the ultimate public sector ownership and responsibility for water supply, the allocation of risks and responsibilities between the public and private sectors, the contribution of resources PPPs (World Bank, 2003). National Audit Office (NAO, 2001) suggests a strict definitions and designing contracts to adequately maintain contractual relationships which requires that public-private parties share a common vision of how best to make them possible to collaborate on a project (NAO, 2001)

2.1.1.5. Project risks in PPP

This becomes a necessary part of the framework due to the fact that all PPP projects are not successful as unexpected major problems can often arise during any stage of the project which jeopardizing the achievement of the project objectives. Tadayan (2012) summarized the most serious effects on project objectives as follows: failure to keep within cost estimate, failure to achieve the required estimate time and failure to achieve the required quality and operational requirements. These unexpected events that when they affect the project objectives represent the project risks.

The origin of risk is the uncertainty inherent to any project and every risk is referred to its specific cause depending on the structure, and the probability or likelihood of the event occurring (Cano and Cruz, 2002). Project risks can be categorized into internal or external (Kolhaktar & Dutta, 2013). An internal risk is unique to a project and is caused by sources inherent in the project; example can be the inability of a product to function properly. Whereas, an external risk has origin in sources external to the project scope.

Akelere (2003) examined the implementation of PPP reported that, the top 10 risks factors common in implementation of PPP should be properly identified and efficiently managed to contribute to the project success. They include political risk, inflation risks, inflation risk, availability risk, regulation risk currency risk, completion risk, regulation risk,, operation risk, technology risk, market risk, and resources risk.

2.1.1.6. Project risks of PPP infrastructure projects

Large infrastructure projects suffer from significant under management of risk in practically all stages of the value chain and throughout the life cycle of a project. In particular, poor risk assessment and risk allocation, for example, through contracts with the builders and financiers, early on in the concept and design phase lead to higher materialized risks and private-financing shortages later on (Pellegrino, 2011).

The structuring and delivery of modern infrastructure projects is extremely complex. The long term character of such projects requires a strategy that appropriately reflects the uncertainty and huge variety of risks they are exposed to over their life cycles. Infrastructure projects also involve a large number of different stakeholders entering the project life cycle at different stages with different roles, responsibilities, risk management capabilities and risk-bearing capacities, and often conflicting interests. While the complexity of these projects requires division of roles and responsibilities among highly specialized players (such as contractors and operators), this leads to significant interface risks among the various stakeholders that materialize throughout the life cycle of the project, and these must be anticipated and managed from the outset(Yamo,2006).

And because infrastructure projects have become and will continue to become significantly larger and more complex, losses due to the cost of undermanaged risks will continue to increase. This will be exacerbated by an ongoing shortage of talent and experience not only

are projects more complex, but there are also more of them, which will create demand for more effective and more systematic approaches and solutions (Pellegrino, 2011).

The risks of large infrastructure projects often do not get properly allocated to the parties that are the best risk owners those that have a superior capability to absorb these risks. This can result from a misunderstanding or disregard on the part of governments of the risk appetite, for instance, of private investors who are sensitive to the kinds of risks they accept and under what terms. Providers of finance will often be the immediate losers from poorly allocated or undermanaged risks. Even in public-private-partnership (PPP) structures, private-risk takers and their management techniques are introduced too late to the process to influence risk management and allocation, and therefore they cannot undo the mistakes already embedded in the projects. One crucial consequence is an increase in the cost of financing PPP projects and a greater need for sovereign guarantees or multilateral-agency support. In the end, however, society at large bears the costs of failures or overruns, not least in the form of missed or slowed growth (Frank Becker, 2008).

2.1.2. Project risk management Strategies in PPP

This is needful because risk management is one of the core issues in ensuring the project's success in Public Private Partnership. 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 Project Management Institute (PMI, 2003). Regardless of the variation in these models, there are key elements that are seen as core in the risk management process and they include risk identification, risk estimation, risk response and risk monitoring and control. Therefore in this framework, risk management is discussed in light of these four stages

2.1.2.1. 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).

2.1.2.2. 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).

2.1.2.3. 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).

2.1.2.4. Risk response strategies in PPP projects

After identifying, analyzing projects risks that are associated with public private partnership projects, the next phase relevant to project risk management is the risk response phase that encompasses risk allocation, risk mitigation, risk avoidance and risk sharing strategies as highlighted here below.

Risk allocation strategy: Depending on the distinctiveness of PPP projects, risk allocation is one of the most important elements in this industry. The risk allocation strategy consists of four parts: the risks that are attributed to the private sector, the risks that are attributed to the public sector, the risks that must be shared and the risks that must be negotiated. (Hwang et al., 2013)

The literature on the keyword “risk allocation of PPP infrastructure projects” is studied. Ke et al. (2010) estimate that the risk of environmental pollution, the risk of political disagreement, the demand risk, the interest rate risk, the inflation risk, the risk of exchange rate fluctuations and the risk of force majeure must be shared; the risk of not obtaining the project, the risk of land acquisition and compensation, the risk of legislative change should be attributed to the public sector; risk of high financial costs, risk of budget overruns, risk of delay, risk of project quality, risk of contractor or supplier default, risk of overbilling operating costs, risk receipt / income and low resale value risk should be attributed to the private sector; force majeure risks, demand risk, inflation risk, risk of interest rate fluctuations, risk of exchange

rate fluctuations, risk of environmental pollution and political disagreement must be shared between the two sectors.

Based on research by Hwang et al. (2013),,risk of environmental pollution, risk of demand, risk of high financial costs, risk of design errors, budget risk, time and quality (performance) risk, late design changes, risk of default of the contractor or supplier and the risk of operating cost overruns are proposed to be allocated to the private sector; the risk of a long decision period must be negotiated; risk of land acquisition and compensation, the risk of legislative change must be spread across the public sector; the risk of interest rate fluctuations, the risk of inflation, the risks of force majeure and the risk of low residual value should be assumed jointly by the two sectors.

According to Ng & Loosemore (2007), the risk of concession termination and the risk of design changes should be attributed to the public sector; demand risk, risk of legislative changes, risk of budget overruns, risk of delay, risk of project quality and risk of running cost overruns should be attributed to the private sector; debt risk, force majeure risk, interest rate fluctuation risk, inflation risk must be shared by the two sectors.

Lam et al. (2007) estimate that the risk of changing the law, the risk of changing inflation, the risk of changing the interest rate, the risk of changing the exchange rate, the risk of localization, the risk of soil conditions , the risk of force majeure, the low resale value and the risk of bad weather should be shared between the two sectors; the public sector must take charge of the risk of government instability, contractual risk and third party risk; approval risk (pending decision), risk of non-payment by subcontractors, quality risk, labor or material risk, risk of design changes, risk of Excessive construction and operating costs and the risk of high financial costs should be shared between the private sector.

Li et al. (2005) opined that private sectors should take risks such as environmental risk, demand risk, risk of interest rate fluctuations, risk of inflation, risk of high financial costs, risk of fluctuations currencies, late changes in design, outsourcing or risk of supplier default, low residual value risk and operating costs outweigh the risk; while the public sector should take risks, such as the risk of land acquisition and compensation, political disagreement and the risk of a long period of decision-making; Risks such as the risk of legislative changes and the risk of force majeure are better shared between the two sectors.

Shen et al. (2006) opined that risks such as land acquisition and compensation risk and the risk of legislative changes should be attributed to the public sector; environmental risk, interest rate variation risk, inflation risk, currency fluctuation risk, force majeure risk and debt risk are represented by making the two sectors together; Income risk, risk of over-exploitation, risk of design error, risk of too high a budget, time and performance risk, and demand risk should be attributed to the private sector.

Ke et al. (2010) believe that the private sector should take into account the risk of environmental pollution, the risk of interest rate fluctuations, the risk of high financial costs, the risk of design errors, the fiscal risk and the time risk. quality risk, risk of default by the contractor or supplier, operating costs exceed the risk and low residual value risk; the risks of force majeure must be dealt with jointly; land acquisition risk and compensation risk, risk of long decision period, risk of inflation and late design changes to be negotiated; The risk of political disagreement, the risk of long-term decision-making and the risk of legislative change should be attributed to the public sector.

Singh & Kalidindi (2016) believe that the public sector should take on the risk of not getting the project, the risk of land acquisition and compensation and political disagreement; the private sector should bear the risks, such as the risk of interest rate fluctuations, fiscal risk, time risk, project quality risk, force majeure risk and overexploitation risk; both sectors must share the risk of legislative change.

Risk avoidance: If the risk is classified as a risk having a negative impact on the whole project, it is important to revisit the objective of the project. In other words, if the risk has a significant impact on the project, the best solution is to avoid it by changing the scope of the project or, in the worst case, canceling it. There are many potential risks to which a project may be exposed that can affect its success (Potts, 2008). Therefore, risk management is necessary in the early stages of a project rather than remedying damage after the risk has occurred (PMI, 2004).

Avoidance means that by looking for alternatives in the project, many risks can be eliminated. While major changes in the project are needed to avoid risks, Darnall and Preston (2010) suggest applying known and well-developed strategies rather than new ones, even

though the new ones may seem more profitable. In this way, risks can be avoided and the work can go smoothly because the strategy is less stressful for the users. Risk avoidance involves modifying the project plan to eliminate the risk or condition that causes the risk in order to protect the project objectives from its impact.

Risk Reduction/Mitigation : Carbonara *et al*. (2015) think that commitment should be given the government to the private company to handle the risk of not getting the project; five mitigation strategies are suggested to deal with the risk of land acquisition and compensation: add every thinkable acquisition and compensation terms in an early stage, set enough capital for accidents, enact the termination articles in the contract, set the interval of the whole construction time, make a flexible schedule; to deal with the political disagreement, surety and recompense should be got from the government; the government should make a pledge for the private company on a rational fluctuation interval of interest rate and promise to give compensation if exceeds the interval in order to handle the risk of the interest rate changes and inflation risk; the government should be responsible for the reimbursement of external obligation originated by abnormal exchange rate changes in order to mitigate the risk of exchange rate changes; to mitigate the legislation change risk, compensation promise

Carbonara et al. (2015) opined that the government should engage with private enterprise to face the risk of not getting the project; five risk mitigation strategies are proposed to deal with the risk of land acquisition and compensation: add all conceivable purchase and compensation conditions at an early stage, establish sufficient capital for accidents, determine termination elements in the contract, determine the interval of all construction time, make a flexible schedule; to resolve the political disagreement, a bond and compensation must be obtained from the government; the government should commit to private enterprise on a rational interval of interest rate movement and promise to compensate if this interval is exceeded in order to absorb the risk of interest rate fluctuations and the risk of inflation.

The government should be responsible for repaying external liabilities resulting from abnormal exchange rate variations in order to reduce the risk of exchange rate variations; to reduce the risk of legislative changes, a promise of compensation must be obtained from the government; by defining the assignment of responsibilities of varied design. imperfections in the contractual agreement in advance, the risk of design error can be resolved; the certainty of the completion of construction with the agreed time of infrastructure projects must be

achieved, otherwise cementing is required to avoid the risk of delay; margin money can be requested from the construction company to avoid the risk of poor quality of the project.

Acceptance of risk: When a risk cannot be transferred or avoided, the best solution is to accept the risk. In this case, the risk must be controlled to minimize the impact of its occurrence (Potts, 2008). This strategy can also be an option when other solutions are not economical (Thomas, 2009). Acceptance indicates a decision not to make changes to the project plan to address a risk or that an appropriate intervention strategy cannot be identified. This strategy can be used for both negative and positive risks. Both types of acceptance develop a contingency plan to be implemented when a risk arises, called positive acceptance, or doing nothing at all, which is passive acceptance. The most common response to the risk assumption is to establish a contingency allowance or reserve, including amounts of time, money, or resources to account for known risks. (Fairley, 2005).

Risk transfer: if a risk can be managed by another actor with a greater capacity or capacity, the best option is to transfer it. Potts (2008) argues that risk should be transferred to those who know how to manage it. The actors to whom the risks can be transferred are, for example, the client, the contractor, the sub-contractor, the designer, etc., depending on the nature of the risk. As a result, this could result in higher costs and additional work, generally referred to as a risk premium (Potts, 2008). It must be recognized that the risk is not excluded; it is only transferred to the party that can best manage it (PMI, 2004). Shifting risks and their associated negative effects is also an option when risks are beyond the control of project management, for example political issues or labor strikes (Darnall and Preston, 2010).

2.1.2.5. 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).

2.1.3. Project performance

Traditionally, projects are considered successful when they meet time, budget and performance goals (Shenhar & Maltz, 2001). Project Management Institute, (2004) refers to measuring the success of a project in terms of time, cost, size, quality and customer satisfaction. According to Hilson, cost, time and performance are typical measures of project success. In the following sections, the main performance indicators of PPP infrastructure projects are explained in more detail, as many authors claim.

2.1.3.1. Budget and time

In other words, a project is often considered successful if it ends within the estimated budget, finishes on time, and performs as planned (Scott-Young & Samson, 2008). While the literature on project management research engages in a fruitful debate on the nature of project success (Dvir et al., 1998), the criteria for project success have become multifaceted. For example, Hackman (1987) assesses the success of a project by measuring customer or target user satisfaction, as well as employee development and satisfaction (Kloppenborg and Opfer, 2002).

2.1.3.2. Quality

The Project Management Institute (2008) assesses the success of projects based on cost, time, quality and stakeholder satisfaction. Therefore, this study chooses the time, costs and profitability of the project as criteria for the success of the project. This is mainly because the measures of cost, time and profitability are objective in nature, allowing direct comparison of projects of different types, ranges and sizes in different industries, especially when the measures are binary measures (Scott -Young and Samson, 2008). Therefore, our dependent variable, Project Success, is binary and indicates that a project is ending on budget and on schedule and making a profit.

2.1.3.3. Efficiency and effectiveness

After monitoring and evaluation the success of several long term business, using multidimensional set of time, the project budget, the effectiveness and efficiency of project achievement, Yu et al. (2005) asserted that quality, time, budget are aspects that should be considered as a core of value-centered model based on net project. The theory was supported by Shenhar et al. (2001) who used project efficiency, customer benefit, organizational

success, and potential benefit to the organization to assess project success; he developed also a cost and net project operation value to evaluate project success.

2.1.3.4. Project sustainability

Different authors discussed the concept of project sustainability basing on the types and structures of such projects. The common views are that the success of any project incorporates sustainability measures. Project sustainability refers to the ability of project to maintain its operations, services and benefits during its projected life time

As it was argued by Project Management Institute (2008), it is important to note is that if a government for reasons better known to itself, decides to provide support to a certain project and maintain its sustainability without regard to its economic viability. As most projects rely on funds from donors and governmental institutions, it is a choice that the government makes integration of beneficiaries in overall phases of project cycle so that after donor's withdrawal the beneficiaries and project activities exert sustainability.

2.2. Empirical literature

In this section refers to empirical literature in the field of project risk management and the performance of infrastructure projects implemented under Public Private Partnership. The researcher explored and presented the findings from other studies respectively to the objectives of this study.

2.2.1. Empirical literature pertaining infrastructures project risks

ISIE,(2012) conducted a study "Risk ranking and analysis in PPP water supply infrastructure projects: an international survey of industry experts". Following extensive literature review and case study analyses, an international questionnaire survey was conducted with practicing and experienced PPP experts to establish the significant risks in PPP water projects. Both the probability of occurrence and severity of 40 risks were evaluated by the expert panel in order to determine their significance and impact on water projects procured under PPP arrangement.

The paper presents a derived risk factor list, ranks the factors, and describes the 'top-ranked' risk factors as: poor contract design; water pricing and tariff review uncertainty; political interference; public resistance to PPP; construction time & cost overrun; non-payment of

bills; lack of PPP experience; financing risk; faulty demand forecasting; high operational costs; and conflict between partners.

Krishna, S. Pribadi (2008) conducted a study "Important risks on public-private partnership scheme in water supply investment in Indonesia" Through guided interview, the study shows that political uncertainties, regulatory mechanism and other components of the scheme contributing to the project revenue, in the local as well as global perspective, are the major risk issues faced by the private sector who are deciding to invest in water supply, particularly in Indonesia. The study shows also that exchange rate fluctuation, government controlled water price and rate of non-revenue water are among the most serious risk factors faced by the investors.

Ernest Effah Ameyaw and Albert P.C.Chan,(2013) conducted a study on Risk ranking and analysis in PPP water supply infrastructure projects. Their paper aims to identify and evaluate the most significant risk factors that strongly affect the implementation of public–private partnership (PPP) water supply projects. Following extensive literature review and case study analyses, an international questionnaire survey was conducted with practicing and experienced PPP experts to establish the significant risks in PPP water projects. Both the probability of occurrence and severity of 40 risks were evaluated by the expert panel to determine their significance and impact on water projects procured under the PPP arrangement. The paper presents a derived risk factor list, ranks the factors and describes the" top-ranked" risk factors as: poor contract design, water pricing and tariff review uncertainty, political interference, public resistance to PPP, construction time and cost overrun, non-payment of bills, lack of PPP experience, financing risk, faulty demand forecasting, high operational costs and conflict between partners.

2.2.2. Empirical literature pertaining management strategies of PPP project risks

Handi sarivar et al(2004)investigate the process of risk identification of private partners PPP hydro-electric power projects in Malaysian. For gathering and collecting data, the researcher applied survey as instrument within a period of two months in Malaysian companies operating under PPP structure.SPSS based on means score was applied to process and analyzes data of the study. The findings revealed that project implementers in the contract based on PPP experience knowledge and experience gaps for adequately allocate and disclose risks affecting the project on the course of their implementation. Another aspect revealed by

the findings of the study that is lack of skills inherent to combinations of several tools applied in project management to identify risks emerging in PPP projects. The findings of the present study can greatly assist public and private partners to select the most appropriate tools for risk identification at the early stages of PPP projects.

Yelin Xu et al (2011) conducted a study "Identification and Allocation of Risks Associated with PPP Water Projects in China" nine case studies were scrutinized to explore the critical risks influencing the success of PPP water projects in China. Eleven critical risks were identified from real-life risk events through the content analysis. They were further analyzed in the aspects of risk origin and their allocation mechanism. The findings of the study indicated that the government risks are considered as the most critical risks encountered by the Chinese project practitioners. Thus, the findings suggested that to allocate risk, industrial practitioners should not only take into account of their management capability, but they should also pay more attention to the overall balance of risks and benefits, and risk guarantee through rigorous contract structure.

2.2.3. Correlation between risk management and the performance of PPP projects

Ozorhon et al. (2007) conducted a study entitled "Effectiveness of risk management on the performance of infrastructures projects in Turkey" with a specific reference of BOT hydro power. The study applied both a questionnaire and guided interview and multiple regression analysis. The findings presented that the risk categories associated with a BOT hydropower plant project in Turkey are viewed into four major project phases: development phase; construction phase; operation phase; and project life cycle phase. The study asserted that risk management process in more detail, arguing that risk management activities have a positive impact on a timely project delivery ($P< 0.05$,$r=0.015$, $b=0.813$),lead to a better estimation of the resources needed to perform a task.

Olaniyi AJ and Onaopepo AD,(2012) studied Project risk management and the performance of Public-Private Partnership (PPP) water supply infrastructures in Nigeria. This study therefore developed a set of Performance Indicators (PIs) for infrastructure Public-Private partnerships in Nigeria. The study employed survey research design approach, extensive literature review was conducted and possible indicators were extracted. Semi-structured interview was then conducted on 12 professionals that have engaged in PPP projects in order to gather their own opinion on the items to be considered while measuring the success or

failure of a PPP project. The outcome of the interview was then synchronized with what was obtained from literatures and then presented in the questionnaire that was administered. A 5-point likert scale was used. 87 questionnaires were administered to professionals with PPP experience and 53 were collected. Mean score, the Kruskal-Wallis test and Spearman rank correlation was used for analysis. The result showed that, there was no significant difference between the sample means of the four groups of respondents i.e. Consultants, Contractors, Government, and Concessionaires. It was also revealed that a high magnitude of correlation exists between risk management and the performance of water supply projects in Nigeria

Another study that has touched on risk management strategies and project performance implemented by PPP in Kenya, is that conducted by Isensi (2006). This study investigated the factors responsible for failure of building construction of hydro power project, their causes and mitigating measures put in place.The sampling frame was drawn from active construction firms registered in categories A andB by the Ministry of Transport, Infrastructure, Housing and Urban Development. This classification was mainly based on the firms' annual turnover. Isensi (2006) identified 36 variables, categorized into cost, time and quality related themes, and which had a statistically significant attribution to project failure.

Yamo (2006) examined the relationship between risk management practices and project performance of PPP in the civil engineering construction sector among firms based in Nairobi, Kenya. The findings indicated elements of strategic planning between Public and Private sector is effective strategy of risk management. The findings further revealed a significant relationship between strategic planning and PPP project performance. Projects that adopted formal project planning and management practices, such as work plans and method statements, and projects risk management, demonstrated much better project completion prospects.

2.3. Critical literature and research gap identification

In this section, the researcher has analyzed the empirical studies by relating them to the current studies. The similarities and dissimilarities from the analysis were presented in order to reveal the gap prompts this study.

2.3.1. Critical literature

International Survey Industry Expert, (2012) conducted a study "Risk ranking and analysis in PPP water supply infrastructure projects: an international survey of industry experts". Geographic scope was 80countries across the world as questionnaires were given out online. However this industry studied water supply infrastructure similar to the current study it didn't emphasize on public institutions that represents a content gap compared to this study.

Handi sarivar et al(2004)investigate the process of risk identification of private partners PPP hydroelectric power projects in Malasia. Data were collected throughout a 2-month period using a survey with a sample of nine Malaysian companies engaged in PPP projects, and the survey results were analyzed using mean scores. This study emphasized on risk identification only there is a content gap to this study as apart from risk identification it intends to investigate also the process of risk management that incorporate risk analysis, risk response and risk control.

The studies conducted by Isensi (2006) and Olanyiet al(2012) limited on the process of identifying risks associated to Projects implemented under PPP.They didn't explore on the types of risks, overcoming strategies and infrastructure projects that represent a gap from the current study.

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.

2.3.2. Identification of research gap

As presented critical literature of this study, many scholars conducted studies on project risk management and project performance in several fields, construction, health services implemented under PPP.They emphasized on risk identification and the relationship with the project performance. They didn't explicitly emphasize on infrastructure projects related to water supply projects. However the researcher cannot declare that the study has revealed all literature on project risk management, there are no such studies conducted specifically in Rwanda. Moreover, the theories prove that there is no blue print of project risks management strategies that were anonymously admitted as a very project displays its structure. It is from

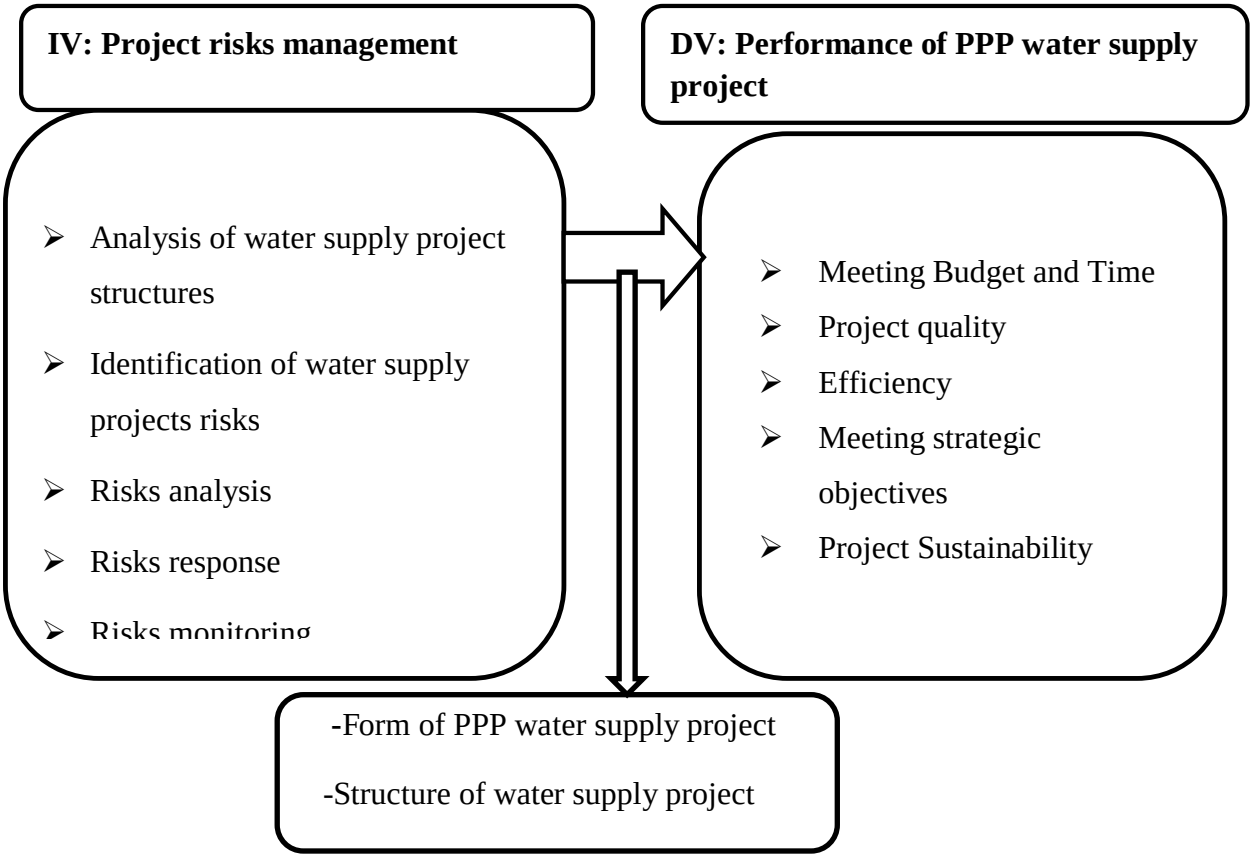
this scenario of lack of such studies on water supply projects and lack of anonymous strategies regarding projects risk management of PPP Infrastructure projects that the researcher got prompted to conduct this study.

2.4. 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 strategy, risk identification, project risk analysis and project risk response

Dependent variable consists of project performance and its respective indicators including timeliness, budget, project sustainability and project effectiveness. 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 PPP infrastructure projects. The common aspects regarding project sustainability the should be taken into account are project quality, budget and time similar to the researcher applied to evaluate the performance of SUS WATER &SANITATION project that was the case study. 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.

Figure1.1: Conceptual framework framework



Source: The researcher compilation, 2020

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

Methodology in research consists of procedures, methods and techniques applied for exploring and studying a particular subject or a type of work. It incorporates tools used to collect data related to the research topic, to determine the sample size, instruments to be used and their validation, methods used to process, analyze and interpret the collected data as well as the limitations encountered by the researcher when carrying out the study. Simple random sampling was used to select WASAC and JICA as case study being organisations that were in charge for implementing SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of Japan International Cooperation Agency (JICA) in Rwanda.

3.2. Research design

Saunders et al.(2007), defines research design as the general plan of how the research questions would be answered. It is the conceptual structure within which research is conducted. It constitutes a blue print for the collection, measurement and analysis of data. A survey is a method of collecting data in which people are asked to answer a number of questions (usually in the form of a questionnaire). The research design for this study is the survey research design to assess the relationship between project risk management and the performance SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 in Rwanda. The focus was put on the project entitled" SUS WATER & SANITATION PROGRAM NO: P-RW-F00-016 "of WASAC implemented by JICA from 2016 to 2018 supported by African Development Bank Group. The study was both qualitative and quantitative in nature and use documentary, questionnaires and unguided interview as instruments of data collection.

3.3. Sampling design

This section refers to the sampling design of this study that includes population of the study, sample size determination process and the sample size as shown here below.

3.3.1. Population of the study

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).WASAC Kigali City has six (blocks) and places branches in each. The branches are under the Commercial Service. All of the branch offices are run under the same system, with a branch manager, Water Distribution Officers, Billing Officers, Customer Service Officers, and Accountant Officers. The numbers of 173 (55% of the total) employees are operation and maintenance engineers of the water distribution network. The permanent staffs of JICA that can comprehend effectively water supply project in Rwanda are 142 people. Thus, 173 employee plus 142 employees make up a total of 315 from them, the researcher derived the sample size that participated in this study as mentioned in the subsequent subsection.

3.3.2. Sampling techniques

Sullivan,(1990) accredits this simple random technique with the exceptional advantage of treating the target population as a unitary whole. In this regard, its attempt to guarantee an equal opportunity may in a way minimize bias and prejudice. This technique is effective to this study because the sample size was deducted from the employees of WASAC and JICA who can comprehend effectively with risk management of water infrastructures projects implemented by their organisations.

3.3.3. Sample size determination

Mbaga (1990) contends that "a sample is a part of the population which is deliberately selected for the purpose of investigating the properties of parent population." According to Mbaga, Grinnell Williams (1990) stipulate that, "a sample is a subject of the population. To determine the sample size, the researcher selected the respondents from Japan International Cooperation Agency (JICA) and WASAC Kigali City from the target population of 315 employees by applying the formula of Sleven (1967) as follows:

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

n= number of sample, N= total population, e=error of tolerance.

$n=\frac{315}{1+315(0.1)2}$ $n=\frac{315}{1+3.15}$, $n=\frac{315}{4.15}$=79.2=**75.9=76 respondents.**

Therefore, the sample size of this study was**76respondents.**

Table 3.1.Determination of the sample size of the study

Stratum	**Population**	**Proportionate sample size**
WASAC staff	62	14
JICA administrative staff	35	9
JICA technical staff	74	17
JICA Project implementers	78	19
JICA project evaluators	38	9
WASAC project evaluators	28	8
Total	**315**	**76**

Source: Primary data

3.4. Measurement and scaling

In order to accomplish this study, two types of data were collected, primary data and secondary data.

3.4.1. Types of data

3.4.1.1. Primary data

The primary data is said to be the first hand observation and investigation. During this study, primary data were collected from the staff of WASAC Kigali City through the questionnaire and private project implementers through guided interview.

3.4.1.2. Secondary data

Secondary data were collected from existing information that was compiled by others. It is usually extracted from the original data and is often the examination of the study someone else has carried out on a subject or an evaluation of commentary. On the course of this study, secondary data were collected from textbooks, internet, and reports from JICA and WASAC reports.

3.4.2. Categories of data

3.4.2.1 Normal data

As nominal data refers to a group of non-parametric variables, the researcher used nominal data to analyze the profile of the respondents that participated in the study as they basically refer to discrete data (Bryman et al, 2007). It incorporate gender, age and experience of the respondents (employees of WASAC and JICA)

3.4.2.2 Ordinary data

Ordinal data reflect quantities that have a natural ordering (Bryman et al,2007). They were used by the researcher to assess the views of the respondents on project risk management and the performance of water supply projects by analyzing the responses extracted from likert-scale questions.

3.5. Data collection procedures

Below are methods that were used by the researcher to process and analyze data relating to this study.

3.5.1. Questionnaire

Grinnell (1990) asserts that a questionnaire is a method used for collecting data; a set of written questions which calls for responses on the part of the clients. It may be either self-administered or group administered. A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents(Bryman et al, 2007).In this research, the Likert-type questionnaire was designed for the study question that addressed the research questions posed for the study to the employees in WASAC that can effectively comprehend to Project risk management and the performance of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

3.5.2. Guided Interview

An interview is a conversation between two or more people where questions are asked by the interviewer to elicit facts or statements from the interviewee (Bryman, et al, 2007).The guided interview was used by the researcher to converse with the project implementers that are members of JICA.

3.5.3. Documentary technique

Documentary technique is the data collection process that is based on reading books and other documents relevant to the study (Gatward, 2004). The researcher employed this method in the study whereby most of documents related to project risk management and project performance were explored to extract data relevant to the content under study.

3.6. Validity and reliability of research instruments

Reliability and validity are two essential parts of any successful research. A researcher requires the quality assessment of the study which is based on two factors reliability and validity of research instruments.(Bailey,1978)

3.6.1. Validity of research instruments

The research instrument that the researcher intends to use is questionnaire. As opined by William (2005), the validity of this instrument refers to how accurately a method measures what it is intended to measure. If the study has high validity that means it produces results that correspond to real properties, characteristics, and variations in the physical or social world. In this research, the content validity index was used. Content validity is the degree to which an instrument has an appropriate sample of items for the construct being measured and is an important procedure in scale development. Content validity index (CVI) is the most widely used index in quantitative evaluation. In this research, the content validity index was calculated from the formula below:

CVI=n/N Where
CVI: Content Validity Index
N: Total number of items in questionnaire
n: Number of relevant items in the questionnaire
The higher the ratio of content validity index the more valid is the instrument of the research. When the ration is less than 0.5 the instrument used for data collection is not valid.

3.6.2. Reliability of research instruments

Reliability consists of the quality of research instrument that pertain the consistency of measuring methods. It is verified achievement of consistent results by using the same methods relying on the same research instrument under the same circumstances for several times. On the course of this study, reliability was tested using the Cranach's alpha correlation

coefficient with the aid of Statistical Package for Social Sciences (SPSS) software. Alpha correlation indicates that the instruments reliable when the coefficient is greater than 0.5. In addition, before administration of the questionnaire to the respondents, a pilot test was done to a sample of 5respondents (employees of WASAC).This helped the researcher to improve the questionnaire.

Table 3.1: Reliability coefficient

Test scale = mean(Unstandardized	**items)**
Average interim covariance:	.8946
Number of items in the scale:	68
Scale reliability coefficient:	0.8196

Source: Primary data, 2020

3.7. Data gathering procedure

3.7.1. Editing

Editing refers to examining the collected raw data to identify and define errors and omission and to collect them when possible. Editing should be done on the course of data collection just after administrating research instrument. Questionnaire would be checked to ensure that all answers given were coherently and logically to provide sufficient information his .On the course of this study, editing was done to ensure the data are accurate consistent with other facts gathered uniformly entered as complete as possible and have been well arranged to facilitate coding and tabulation.

3.7.2 Coding

According to Rowley (2006), coding is the procedure by which data are categorized. Through coding the raw data are transformed into symbols usually numerals that may be tabulated and counted. The transformation is not automatic: however, it involves judgment on the part of coder.

3.7.3. Tabulation

Lewis (2009) argued that tabulation refers to the part of technical process on statistical analysis of data that involves counting to determine the number cases that fall into various categories. Thus after eliminating errors, codes were assigned to each answer. This stage led

to the construction of statistical tables showing frequency distribution of answers to questions addressed to respondents.

3.8. Data processing and analysis

3.8.1. Data processing

This part of researcher study is very important to the research after data collection in any scientific and accounting, research, there is a need to condense the large quantities of data collected these facilities easy processing of data collected it is necessary to edit code tabulate and analyze, present as actual finding of the study (Rowley,J., 2006).On the course of this study, the researcher used SPSS for data processing. The codes were assigned on the questionnaires were applied for converting into secondary data that are susceptible for convenient interpretation.

3.8.2. Data analysis

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. To analyze the relationship between project risk management and the performance of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016. The tool of correlation analysis was developed to study and measure the statistical relationship that exists between two variables by indicating the strength and closeness of the relationship between projects risk management and the performance of water supply projects. To interpret the data collected from guided interview, the researcher applied content analysis method and narrative method analysis.

Table 3.1: Interpretation of mean and standard deviation

Mean	1 to 1.49 1.5 to 2.49 2.5 to 3.49 3.5 to 4.49 4.5 to 5	Very low Low Moderate Strong Very strong
Standard deviation	Under to 1 Over to 1	Monogenic Heterogenic

Source: Franklin (2009)

Pearson correlation coefficient is one of correlation coeffiecients applied to measure the closeness of variables under study. It assesses whether, one variable increases, the other variable tends to increase, without requiring that increase to be represented which proves a linear relationship.

Table 3.2: The intervals of correlation between variables.

1	$p = 1$	Perfect correlation
2	$0.9 \leq p < 1$	Strong correlation (very high)
3	$0.7 \leq p < 0.9$	High correlation
4	$0.5 \leq p < 0.7$	Moderate correlation
5	$p < 0.5$	Weak correlation (low)
6	$p = 0$	Absence of correlation

Source: Franklin (2009)

3.9. Ethical consideration

The data collection procedure was implemented as follows: Before the administration of the questionnaires, the researcher requested for appointment of WASAC and JICA employees and projects implementers.Describe the extent to which results would be kept confidentially. State that a participant is voluntary and that they are free; explain to them what the study is all about.

CHAPTER FOUR

DATA ANALYSIS PRESENTATION AND INTERPRETATION OF FINDINGS

4.0. Introduction

This chapter represents the presentation, analysis and interpretation of primary data collected from the respondents regarding the project risk management and the performance of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of Japan International Cooperation Agency (JICA) in Rwanda. On the course of this chapter, the researcher analyzed the risks associated by the project under study, the severity of risks, risk probability, the strategies applied by the project implementers to guess the risks inherent to the project undertaken, the strategies applied to overcome the risks that faced of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 on the course of its implementation and the effectiveness of its success.Therefore,statistical package for Social Sciences (SPSS) with descriptive statistic was used to analyze and interpret data with correlation design to find the relationship between risks management and the performance of the project under study.

4.1. Data regarding the background of the respondents

This section refers to the presentation, analysis and interpretation of data regarding the background of the respondents who participated in this study. As far as research methodology is concerned, a researcher analyzed thebackground of the respondents to ensure the impact of their competence on the accuracy, availability and validity of data collected from them. As depicted in tables 4.3;4.4,4.5 of chapter four, the researcher presented, analyzed the age, educational background and their experience of the respondents that were selected from two parties that contributed to the implementation of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 that are WASAC Rwanda Staff and Japan International Cooperation Agency.

Table 3: Educational level of the respondents

		Frequency	Percent	Cumulative Percent
Valid	Engineer (A1)	9	11.8	11.8
	Engineer (A0)	32	42.1	53.9
	Masters	24	31.6	85.5
	Other levels	11	14.5	100.0
	Total	**76**	**100.0**	

Source: Primary data, September 2020

Table 4.3 represents the level of education of the respondents. As the case Study is refers to implementation of water supply project, educational level is of the paramount importance. It is represented that 32 respondents that are 42.1% hold bachelor level in construction, 24 respondents that cover 31.6% did masters level, 11 respondents that cover 14.5 % hold other levels and 9 respondents that are 11.8% are undergraduate with A1 .From the table, it is found out that the sample that participated in this study is effectively educated to contribute efficiently to the performance of SUS WATER&SANITATION PROJECT. This also ensured the accuracy of data collected from them as the researcher used the questionnaire.as instrument of data collection. It implies that the educational background of the respondents enables them to interpret adequately the instrument of data collection.

Table 4.4: Experience of the respondents

		Frequency	Percent	Cumulative Percent
Valid	One year and less	2	2.6	2.6
	2-5 years	28	36.8	39.4
	6-10Years	34	44.7	84.1
	Above 10 Years	12	15.9	100.0
	Total	**76**	**100.0**	

Source: Primary data, 2020

Table 4.4 portrays the experience of the respondents.2.6% had experience less than a year,36.8% worked there for 2-5 years,44.7% have worked in organisations for a period 6-10

years, and the rest corresponding to 15.9% had spent more than 10years. The experience of an employee within organization is a considerable issue as the more experience of an employee, the more his/her performance. From the findings, it is seen that at least 85% of the respondents had 4 years of experience. Thus, they contribute effectively to the performance of water supply infrastructure projects implemented by their organisations and have a positive impact on the credibility data of this study relevant to project risks management and the performance of water supply infrastructure projects.

4.2. Presentation of data relevant to project risk management and project performance

In this section, the researcher presented, analyzed and interpreted data regarding the risks that affected SUS WATER & SANITATION PROJECT NO: P-RW-F0016, the severity of risks towards the project under study.

4.2.1. Identification of risks that affected the project

This sub-section refers to presentation, analysis and interpretation of primary data collected on the course of this study regarding the project risk management and the performance of SUS WATER & SANITATION PROJECT NO: P-RW-F00-designed to rehabilitate and extend water supply networks in Kigali and pre-urban areas of Rwanda managed by WASAC and admitted by Ministry of infrastructure of Rwanda and implemented by Japanese International Cooperation(JICA) As extended by the objectives of the study, the focus was put on risks probability, risks severity, risks management strategies and the success of project under study.

4.2.1.1. Risks that affected SUS WATER & SANITATION PROJECT

In this subsection, the researcher has presented analyzed and interpreted the views of the respondents regarding the probability of risks occurrence regarding SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of NPD Rwanda. As shown in the following tables, risks are allocated in three categories: Risks associated with public side, risks from private side and risks inherent from both public and private sides.

Table 4.5. Public sector risk affected SUS WATER & SANITATION PROJECT

	N	Min	Max	Mean
Poor contract design	76	1.00	4.00	3.351
Accuracy of the project	76	1.00	4.00	3.457
Project exerted poor management	76	1.00	3.00	1.822
High operational cost	76	1.00	4.00	3.601
Low quality of low water	76	1.00	4.00	1.862
Corruption	76	1.00	3.00	1.646
Water assets condition uncertainty	76	1.00	4.00	2.292
Risks inherent to land acquisition	76	1.00	4.00	2.683
Poor private operator	76	3.00	4.00	2.462
Law water scarcity	76	1.00	3.00	3.846
Pipeline failure during distribution	76	1.00	4.00	3.992
Inadequacy of technology	76	1.00	4.00	3.483
Inflation due to currency convertibility	76	3.00	4.00	3.862
Poor performance of subcontractor	76	1.00	3.00	1.615
Labor cost/availability/supply/performance	76	1.00	3.00	4.154
Completeness/timeliness of project	76	1.00	5.00	4.017
Inadequacy of plant cost	76	2.00	5.00	2.521
Unavailability of construction resources	76	1.00	3.00	3.614
High cost of supply chain	76	1.00	4.00	3.820
Quality of construction materials	76	1.00	4.00	3.909
Construction materials are barely available	76	1.00	4.00	3.629

Source: Primary data, 2020.

Table 4.5 depicts the views of the respondents that are the staff of WASAC Main branch and the Japanese constructor on the risks from public sector that affected the project under study. As shown in the table the probability that pertain the accordance of the risks on the course the

project implementation is expressed by risks mean and standard deviation. The project faced the risk of labor cost availability indicated by a very strong mean of 4.154, the project faced a faced a risks of completeness and timeliness of the project as it bears a strong mean of 4.017,there was a risk of pipeline failure during distribution indicated by a strong mean of 3.999, the was a risks inherent to quality of construction materials mean with a strong mean of 3.909,high cost of supply chain was another risk indicated by a mean of 3.820,there was a risk regarding to inflation due to currency convertibility with a strong mean of 3.862,the risk regarding lack the accuracy mean with a strong mean 3.457,poor contract design and unavailability of construction resources was is expressed by a strong mean of 3.614.The risks presented from the table affected the project under study they are in a range of strong and very strong mean. The findings from the table are similar to the views asserted by Marques & Berg (2011) who asserted that risks such as environmental risk, demand risk, and force majeure risk ought to be jointly undertaken; private sector should take care of the risks such as inflation risk, risk of high financial costs, design defect risk, project quality risk and operating cost overspends risk; legislation change risk should be undertaken by the public sector.

Table 4.6: Risks inherent to public sector

	N	Min	Max	Mean
Delay of financial resources	76	1.00	4.00	4.138
Political interference	76	1.00	4.00	2.080
Non-payment of bills	76	1.00	4.00	1.907
Change in government opposition	76	1.00	4.00	3.762
Government instability	76	1.00	4.00	1.814
Delayed payment of subcontractor	76	1.00	4.00	3.992
Valid N (listwise)	76			

Source: Primary data, 2020

Table 4.6 shows the views of the respondents on the risks emanating from the public sides that SUS WATER AND SANITATION project faced on the course of its implementation. As depicted in the table, public risks that were observed on the processus of project implementation are financial resources risks expressed by a strong of 4.138, delayed payment of subcontractors riskindicated by a strong mean of 3.992, change in government position

risk with a strong mean of 3.762, and delay of financial resources with a strong mean 4.138.The findings presented in the table indicate that the project faced public risks at moderate level as the average mean falls at 2.94.The findings from the table reflect the views opined by (De Brux, 2010)PPP water project infrastructure projects are usually vulnerable to risks due to the fact PPP contracts are too complicated it is impossible to implement such projects without public and private risks.

Table 4.7: Private sector risk affected SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

	N	Min	Max	Mean
Lack of PPP experience	76	2.00	4.00	1.538
Conflict between partners	76	2.00	4.00	3.507
Cost overrun(Construction time)	76	1.00	4.00	4.131
Unfavorable local /grobal economy	76	1.00	4.00	3.015
Force majeure	76	1.00	4.00	3.761
Delayed permit insurance	76	1.00	4.00	2.715
Accidents and safety	76	1.00	4.00	3.965
Delayed claims resolutions	76	1.00	4.00	3.714
Valid N (listwise)	76			

Source: Primary data, 2020

Table 4.7Represents the primary data regarding the risks inherent to private sector that affected SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 project. On the basis of the extent to which risks bear strong mean, the most considered private mean that were observed are cost overrun risk expressed by a strong mean 4.131, accidents and safety risks strong mean of 3.965,force majeure risk that reflect climate change strong mean of 3.761,delayed claim resolution risk indicated by a strong mean of 3.714 unfavorable global economy risk expressed by a mean of 3.015;conflict between WASAC and JICA as indicated by a strong mean of 3.507.From findings, it is notable that SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 project faced several private risks. The findings of the study presented in this table show that the types of risks that are suggested by Ke*et al*. (2010) are similar to the ones disclosed by this study. They include the environmental pollution risk,

interest rate change risk, high financial costs risk, design defect risk, budget risk, and time risk. quality risk, contractor or supplier default risk, operating cost overspends risk and low residual value risk; force majeure risks should be undertaken jointly; risk of land acquisition and compensation risk, risk of long period of decision pending, inflation risk and too late changes in design should be negotiated; political disagreement risk, risk of long period of decision pending and the legislation change risk are to be allocated to the public sector.

4.2.1.2. Presentation of data inherent to risks severity

In this subsection, the researcher presented analysis and interpretation of data regarding the extent to which the aforementioned risks affected SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of NPD Rwanda. The projects implemented by WASAC in partnership Japan International Cooperation Agency. The risks are allocated in three categories; public risks, private sector risks and public-private risks. After identifying the risks that affected the project under study on the course of its implementation, the researcher investigated the extent to which the risks affected effective implementation of the projects.

Table 4.8: The severity SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

	N	Min	Max	Mean	Rank	Std. Dev
Poor contract design	76	1.00	5.00	3.351	11	.662
Accuracy of the project	76	1.00	5.00	3.457	10	.751
High operational cost	76	1.00	5.00	3.901	4	.718
Pipeline failure during distribution	76	1.00	5.00	3.932	3	.883
Inadequacy of technology	76	1.00	5.00	3.483	9	.785
Inflation due to currency convertibility	76	3.00	5.00	3.862	4	.752
Labor cost/availability/performance	76	1.00	5.00	4.154	1	.254
Completeness/timeliness of project	76	1.00	5.00	4.017	2	.254
Inadequacy of plant cost	76	2.00	5.00	3.521	8	.615
Unavailability of construction resources	76	1.00	5.00	3.614	6	.574
High cost of supply chain	76	1.00	5.00	3.220	12	.412.
Quality of construction materials	76	1.00	5.00	3.607	7	.918

	N	Min	Max	Mean	Rank	Std. Dev
Poor contract design	76	1.00	5.00	3.351	11	.662
Accuracy of the project	76	1.00	5.00	3.457	10	.751
High operational cost	76	1.00	5.00	3.901	4	.718
Pipeline failure during distribution	76	1.00	5.00	3.932	3	.883
Inadequacy of technology	76	1.00	5.00	3.483	9	.785
Construction materials are barely available	76	1.00	5.00	3.629	5	.718

Source: Primary data, 2020

Table 4.8 depicts the views of the respondents on the severity the risks exercised on the SUS WATER AND SANITATION PROJECT of WASAC implemented by JICA Company in Kigali and pre-urban region of Rwanda. The researcher grouped the severity of risks regarding the men that the respondents ascertained on the risks. As shown in the table, labor cost/availability/effective performance and meeting the expected time scope of the project were the prevailing barrier with a strong means of 4.154 and 4.017 respectively. Other following risks of moderate severity were asserted by the respondents pipeline failure during distribution strong mean of 3.9932,high operating cost risk indicated by a strong mean of 3.901,difficulties of construction materials availability risk expressed by a moderate 3.429,affordability of construction materials of the appropriate quality risks with a strong mean of 3,567.On the basis of the findings depicted in the table, the researcher found out that the project exerted several risks that their management could require great and adequate effort. It reflects the literature presented earlier in this study arguing that PPP infrastructure projects are usually vulnerable to risks due to several reasons. First, PPP contracts are too complicated and incomplete, and thus it is impossible to cover all the risks in the clauses (De Brux, 2010). In addition, many risks in PPP infrastructure projects are very difficult to be precisely assessed due to large project scales and long durations. For instance, underesti-mation of demand shortfall is quite normal in traffic projects (Cruz & Marques, 2013).

Table 4.9: Risks inherent to public sector

	N	Min	Max	Mean	Rank
Delay of financial resources	76	1.00	5.00	4.108	1
Change in government positions	76	1.00	5.00	3.262	3
Delayed payment of subcontractor	76	1.00	5.00	3.742	2
Valid N (listwise)	76				

Source: Primary data, 2020

Table 4.9 depicts the views of the respondents on the extent to which the risks affected SUS WATER AND SANITATION PROJECT of WASAC implemented by Japanese International Cooperation Company. As shown in the table, the public sector risks that exerted a sophisticated management on the side of project implementers are delay of financial resource risk expressed by a strong mean of 4.108, and delay payment of subcontractor expressed by a strong mean of 3.742.Another others risks that faced SUS WATER AND SANITATION PROJECT are changes in government position expressed by a moderate mean of 3.262.

The delay of financial resources are justified by the fact that financial flow of resources had to be credited to Ministry of Infrastructure as the first recipient, then to WASAC as the second recipient and the to JICA after monitoring and evaluation executed by WASAC which lead to delayed payment of subcontractor.

Table 4.10: Risks associated to both private and public sector

	N	Min	Max	Mean	Rank
Conflict between partners	76	1.00	5.00	3.997	2
Cost overrun(Construction time)	76	1.00	5.00	4.501	1
Unfavorable local /global economy	76	1.00	5.00	3.015	6
Force majeure	76	1.00	5.00	3.761	4
Accidents and safety	76	1.00	5.00	3.965	3
Delayed claims resolutions	76	1.00	5.00	3.714	5
Valid N (listwise)	76				

Source: Primary data, 2020

Table 4.10 represents the views of the respondents on the extent of severity that the risks inherent to both private and public sides affected SUS WATER and SANITATION PROJECT by WASAC. As shown in the table, the risks that affected the project are cost overrun mean expressed by a very strong mean of 4.501, conflicts between partners risk expressed by a strong mean of 3.997;the third is accidents and safety risk expressed by 3.965 ,the fourth is force majeure/climate change risk expressed by a strong mean of 3.761,the fifth observed risk is delayed claims resolutions with a strong mean of 3.714. The findings are similar to the views of Ke*et al*. (2010) who asserted that most PPP projects face several risks including the environmental pollution risk, interest rate change risk, high financial costs risk, design defect risk, budget risk, and time risk. quality risk, contractor or supplier default risk, operating cost overspends risk and low residual value risk; force majeure risks should be undertaken jointly; risk of land acquisition and compensation risk, risk of long period of decision pending, inflation risk and too late changes in design should be negotiated; political disagreement risk, risk of long period of decision pending and the legislation change risk are to be allocated to the public sector.

4.2.2. Risk management strategies towards SUS WATER SANITATION PROJECT

This subsection represents primary data relevant to risks management practice applied by the parties that were in charge of SUS WATER SANITATION PROJECT. Prior to investigating,

assessing and evaluating the effectiveness of risks management strategies applied, the researcher had identified the types of risks, analyzed the severity that the risks exercised towards the implementation of SUS WATER SANITATION PROJECT as mentioned in subsequent sections of this chapter. Thus, the subsection emphasized on risks management strategies and the success of SUS WATER SANITATION PROJECT.

Table 4.11: Strategies of risks identification

	N	Min	Max	Mean
Application of interview technique	76	1.00	5.00	3.913
Usage of questionnaire	76	1.00	5.00	3.817
Application of observation technique	76	1.00	5.00	4.087
Valid N (listwise)	76			

Source: Primary data, 2020

Table 4.11depicts the views of the respondents regarding the approaches and strategies that WASAC and JICA applied to identify the strategies applied to disclose the risks inherent to SUS WATER AND SANITATION project. As shown in the table, three techniques are applied that are application of observation technique expressed by a strong mean of 4.087, application of interview agreed by the respondents at a strong mean of 3.913 and usage of the questionnaire also admitted by the respondents with a strong mean of 3.817.The findings of the study prove that the parties that contributed to the implementation of the projects applied effective approach as extend by project management theories that can enable the implementers to overcome several risks that were disclosed on the course of this study. The findings coincide the theories argued by Project management institute asserting 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. Several instruments including surveys, observations and questionnaires should be applied (PMI, 2004).It was supported by Bakker et al. (2012) who emphasized on the importance of risk identification as the most influential process on project performance in terms of numbers as well as in the strength of

communications effects, followed by risk reporting, risk registration and risk allocation, risk analysis, and finally risk control.

Table 4.12: Risks analysis approaches towards SUS WATER &SANITATION Project

	N	Min	Max	Mean
Application of ranking technique	76	1.00	5.00	4.511
Monitoring and evaluation	76	1.00	4.00	4.195
Impact assessment	76	1.00	5.00	4.093
Risk probability	76	1.00	5.00	3.903
Prioritization	76	1.00	5.00	4.174
Valid N (listwise)	76			

Source: Primary data, 2020

Table 4.12 depicts the views of the respondents regarding risks analysis approaches applied towards the management of SUS WATER AND SANITATION project. As presented in the table, they involved parties carried out monitoring and evaluation approach indicated by a strong mean of 4.195, allocating the severity of risk by ranking expressed by a strong mean of 4.511,impact assessment approach agreed at a strong mean of 4.093, prioritization of risks also agreed by the respondents at a strong mean of 4.174, and ascertaining risks probability indicated by also strong mean of 3.903. On the basis of the findings presented in the table above, the researcher found out that there has been effective analysis of risks that could contribute to the overall risks management of SUS WATER AND SANITATION project.

Table 4.13: Application of risk response

	N	Min	Max	Mean
Application of risk allocation technique	76	1.00	5.00	3.921
Risk transference technique	76	1.00	4.00	3.897
Application of risks mitigation	76	1.00	5.00	3.610
Application of risks avoidance technique	76	1.00	5.00	3.603
Risks acceptance	76	1.00	5.00	3.714
Valid N (listwise)	76			

Source: Primary data

After identifying and analysis the ricks that could affect SUS WATER&SANITATION project, implementation team made decisions regarding identified and analyzed risks. As depicted in the table, risks allocation techniques was applied with a strong mean of 3.9, some risks were transferred to the parties that were able to manage them effectively indicated by strong mean of 3.897, some risks were escaped strong mean of 3.61, the respondents asserted that they applied risks avoidance as expressed at a strong mean of 3.603,some risks were accepted including cost overrun as indicated by also a strong mean of 3.714.These findings are supported by the views from other others. Shenhar and Dvir (2010),demonstrate that adopting risk management practices has a significant positive impact on the success of infrastructure projects. They also show a positive impact from the presence of a risk manager on project performance.

4.2.3. Effectiveness and efficient of project implementation

In order to verify whether they have been effective risks management, the researcher investigated the effectiveness and efficient of SUS WATER and SANITATION achievements. This subsection and the following table shows the related data.

Table 4.14: Assessing the effectiveness of project implementation

	N	Min	Max	Mean
Effectiveness of project implementation	76	1.00	5.00	3.980
Effectiveness of risks management	76	1.00	5.00	3.945
Meeting the time scope	76	1.00	5.00	1.052
Meeting the budget	76	1.00	5.00	1.946
Sustainability of the projects	76	1.00	5.00	3.570
Valid N (listwise)	76			

Source: Primary data, 2020

After assessing the aspects inherent to risks management processes applied by the implementers of SUS WATER&SANITATION project, the researcher investigated the success of the project. As shown in the corresponding table, most of the respondents who participated in this study proudly asserted that SUS WATER& SANITATION project

experienced effective implementation as they agreed at a strong mean of 3.98, they alleged that the risks that had been affecting the project were adequately managed with a strong mean of 3.945 and asserted that the project is sustainable as it was well implemented.

On the basis of the findings presented in this table, the researcher found that SUS WATER&SANITATION project experienced several risks that were effectively managed to contribute to the project success and proved by the data collected from the respondents. However due to the fact that the project was implemented under the umbrella of three parties, there had been a gap for meeting the time scope that led to supplementary budget and the cost overrun of the project that justify why the respondents asserted that the project was success at moderate level as the corresponding mean is 3.98.

4.3. Test hypothesis

Null hypothesis stipulating that there is no statistical significance between the two variables and the alternative hypothesis that proves a statistical significance between risks management and project performance were tested as depicted in the following tables.

Table 4.15: Correlation coefficient between risks management and project performance

		Public transportation of RFTC	**Spread of contagious diseases**
Risks management	Pearson Correlation	1	.740**
	Sig. (2-tailed)		.000
	N	76	76
Project performance	Pearson Correlation	.740**	1
	Sig. (2-tailed)	.000	
	N	76	76

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

Table 4.15 shows the correlation between risks management and the performance of water supply project. It is seen that the variables are correlated at 0.01 level 2-tailled with a coefficient of 0.740.Where the P value on both variable is 0.000.From the table, the researcher found out that risks management and water project performance are statistically

significant which prove a strong relationship between the two variables under study. The results from the table shows that the third objective of the study stipulating whether there is a relationship between the two variables, is achieved by the researcher.

Table 4.16: Standardised coefficient of null hypothesis

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Confidence level (95%)	
	B	Std. Error	Beta				
1.Risks	.191	.279		.686	.594	-2.78	2.09
	.426	.096	.417	4.426	.000	-.566	2.01

a. Dependent Variable: Project performance

As the rule of thumb asserts that two variables are statistically significant when their P-values are between 0 to 0.05 and the P-value indicated in the table is 0.594 and 000 which is higher than the standards also greater than the confidential level. The researcher found out that the two variables are not statistically significant. Thus, on the basis of these findings, this hypothesis stipulating that there is no relationship between risk management and project performance is verified and rejected by the researcher.

Table 4.17: Verification of the second hypothesis

Model		Un standardized Coefficients		Standardized Coefficients	T	Sig.	Confidence level (95%)	
		B	Std. Error	Beta				
1	Risk management	.659	.139	.671	4.748	.000	-1.51	2.11
		.718	.091	.633	7.883	.000	-.566	2.06

a. Dependent Variable: Project performance

The table intends to verify the relationship between risks management and project performance. As shown by the table, risks management has been considered as the predictor.

It is seen that the level of project performance increase from 0.66 plus risks management times 0.7. As the rule of thumb asserts that significant correlation between two variables should be ranked between 0 to 0.5 and the P-value indicated in the table are 0.000 and 000, the researcher found out that there is a significant relationship between risks management and project performance. Thus, on the basis of these findings, this hypothesis stipulating that there is a relationship between risks management and project performance is verified and confirmed by the researcher

4.4. Content analysis inherent to interview guide

This section refers to the presentation, analysis and interpretation of primary data collected through guided interview that was administered to the implementer of the project that was a construction operations coordinator of Japan International cooperation Agency (JIC) that implemented SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda.

4.4.1. The coverage of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

The respondents alleged that the coverage period of the project was scoped in three years from 2016 to 2018 .Due to the difficulties the project experienced on the course of its implementation, the implementation of the project was extended and took the closure in August 2019.The views of the respondents asset that the project time aspect was not met as it was designed.

4.4.2. The stakeholders that were involved in implementation

SUS water sanitation project was implemented in Kigali and semi-urban areas. It was initiated by the Ministry of infrastructure in Rwanda and designed by WASAC Rwanda. The implementation was done by Japan International Corporation Agency. It implies that WASAC employees, JICA employees were stakeholders involved in project implementation and the users of water the population of Rwanda living in Kigali and its around remote areas who utilize water from Nzove, Kanzenze and Gihira water treatment plants.

4.4.3. Risks exerted by SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

The study disclosed that SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 experienced several risks including high financial costs risks, design defect risks, budget risk, time risk, quality risk, contractor or supplier default, operating cost. Project implementers

profoundly asserted that the major risks that exercised high severity on the projects is financial delay inherent to the fact that JICA was operating under the WASAC which implies that JICA acted as the subcontract. As a subcontractor, it experienced financial resources risks as it was the second recipient of financial resources.

The other major challenge is poor pre-study of the project. The respondent asserted that on the course of project implementation, installation of water pipes faced unexpected other infrastructures like fibres that urged project implementers reinstallation of fibres .Thus, it urged a supplementary budget that lead to huge amount of cost overrun.

Implementers also asserted that as the projects was implemented in phases at different locations; the project faced a scarcity of workers on some specific tasks to work at different locations simultaneously which would have shortened the implementation time.

4.4.3. Indicators of project success

The study revealed that SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 was finally adequately implemented as regardless extension of time and supplementary expenses, the objectives of the projects were effectively achieved. Apart from the project under study, the respondent asserted that several projects in infrastructure water supply project, normally experience such risks and give verdict that the paramount aspect is to enhance the capacity of risks management inherent to the water supply infrastructure projects.Theferore, the researcher found out that the findings disclosed from the interview coincide the findings disclosed through data collected from questionnaires that also reflect the theories presented in the literature reviews of the study.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

The chapter deals with the summary of major findings extracted from the chapter four respectively to the objectives of the study that are to explore risks facing infrastructures projects implemented by WASAC, to identify the project risk management strategies applied by WASAC and to establish a relationship between risks management and projects performance of WASAC with a specific reference of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 headed by WASAC Rwanda and implemented in collaboration of Japan International Cooperation Agency (JICA) in Rwanda,the researcher further presented the conclusion inherent to the overall findings of the study and recommendations based on the findings.

5.1. Summary of findings

5.1.1. Risks facing infrastructures projects implemented by WASAC

The study revealed that SUS WATER & SANITATION PROJECT faced several risks that are labor cost, completeness and timeliness of the project ,pipeline failure during distribution ,quality of construction materials, high cost of supply chain, inflation due to currency convertibility, the project lack the accuracy ,poor contract design and unavailability of construction resources.SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 faced several risks that could prevents its performance as it was designed to be implemented in different regions of Rwanda. SUS WATER AND SANITATION project faced on the course of its implementation. . The views of the respondents on the risks emanating from the public sides that SUS WATER AND SANITATION project faced on the course of its implementation. They include delay of financial resources mean=4.138, delayed payment of subcontractors mean=3.992,change in government position mean=3.762,and delay of financial resources with a great mean of 4.138.

5.1.2.Extent of severity risks that affected SUS WATER & SANITATION PROJECT

Labor cost/availability/effective performance and meeting the expected time scope of the project were the prevailing barrier with strong mean. Other following risks of moderate

severity were asserted by the respondents pipeline failure during distribution, high operating cost, difficulties of construction materials availability, affordability of construction materials of the appropriate quality, inadequacy of technology, accuracy of the project, poor contract design and high cost of supply chain. From the findings, the researcher found out that this is obvious in the context of water supply project where by the relevant theories provide that private sector should take care of interest rate change, and force majeure risks.

The most paramount barrier that hindered the project is delay of financial resources. They alleged that the project referred to rehabilitation, upgrading and extension of water supply network in Kigali city and pre-urban areas admitted by the Ministry of infrastructure of Rwanda and implemented under support of African Development Bank. The delay of financial resources are justified by the fact that financial flow of resources had to be credited to Ministry of Infrastructure as the first recipient, then to WASAC as the second recipient and the to JICA after monitoring and evaluation executed by WASAC which lead to delayed payment of subcontractor.

Regarding the severity of risks inherent to both private and public sides affected SUS WATER and SANITATION PROJECT by WASAC in urban and semi urban areas of Rwanda. As shown in the table, the severity of risks is allocated regarding to the mean they bear from the views of the respondents. As shown in the table,the risks that affected the project are cost overrun ,conflicts between partners; accidents and safety ,force majeure/climate chang,delayed claims resolutions and unfavorable global economy. From the findings represented in the table, the researcher ensured that some risks proposed by the researcher on the questionnaire did not affect negatively this project. These are the ones appearing in the aforementioned table .They include the lack of PPP experience and delayed permit insurance.

5.1.3. Risks management strategies implemented towards SUS WATER SANITATIONPROJECT

The study revealed that three techniques were applied on the course of project to identify risks that are application of observation technique, application of interview and usage of the questionnaire. Regarding risks analysis approaches applied towards the management of SUS WATER AND SANITATION project, they involved parties carried out monitoring and evaluation approach, impact assessment, prioritization of risks, ascertaining risks probability and application of ranking technique. On the basis of the findings, the researcher found out

that there has been effective analysis of risks that could contribute to the overall risks management of the projects. Risks allocation techniques was applied , some risks were transferred to the parties that were able to manage them effectively ,risks were avoided and other risks including time extension, cost overrun, implementation of unplanned activities including shifting some other infrastructures like electric poles, maintaining roads allow water pipes installation were accepted.

5.1.4. Relationship between risks management and project performance

Most of the respondents who participated in this study proudly asserted that SUS WATER& SANITATION project experienced effective implementation mean=3.98,they alleged that the risks that had been affecting the project were adequately managed mean=3.945 and asserted that the project is sustainable as it was well implemented. They asserted that the effectiveness of project implementation resulted adequately to the effective and efficient risks management.

On the other hand, the study revealed that the project was finally achieve its success at a moderate level as there were gaps as disclosed by the respondents .They asserted that SUS WATER SANITATION exerted great amount of cost overrun mean=1.94 pertaining that the project didn't meet the extended budget as it didn't meet the expected time mean=1.946.As This is evident and obvious as the project had been planned to be implemented in but the time was extended.

As shown in the correlation design, risks management of SUS WATER&SANITATION project has been considered as the predictor. It is seen that the level of risks management change from 0.66 plus project performance 0.7.This reflects that project risks management effects adequately effective performance. As the rule of thumb asserts that significant correlation between two variables should be ranked between 0 to 0.5 and the P-value indicated in the table are 0.000 and 000,the researcher found out that there is a significant relationship between risks management and the performance of the project. On the basis of the findings presented in this table, the researcher declare that the hypothesis of the study stipulating that there is a relationship between project risks management and project performance is verified and confirmed.

5.2. Conclusion

The study revealed that SUS WATER&SANITATION project experienced several risks that were effectively managed to contribute to the project success and proved by the data

collected from the respondents. However due to the fact that the project was implemented under the umbrella of three parties, there had been a gap for meeting the time scope that led to supplementary budget and the cost overrun of the project that justify why the respondents asserted that the project was success at moderate level as the corresponding mean is 3.98.

They respondents profoundly asserted that the major risks that exercised high severity on the projects is financial delay inherent to the fact that JICA operated under the WASAC which implies that JICA acted as the subcontract. As a subcontractor, it experienced financial resources risks as it was the second recipient of financial resources. The other major challenge is poor pre-study of the project. The respondent asserted that on the course of project implementation, installation of water pipes faced unexpected other infrastructures like fibres that urged project implementers reinstallation of fibres .Thus, it urged a supplementary budget that lead to huge amount of costoverrun.

The findings of the study revealed that the objectives of the study were moderately achieved as the indicators of the projects success incorporating the effectiveness, efficiency and project sustainability were achieved by SUS WATER&SANITATION Project and the gap emanating from project time and meeting the budget was observed and justified by the long time span that risk management process covers.

Matching the findings of this study to the literatures presented in the second chapter of this study, the researcher find out that gap incited this study was that PPP projects in water supply projects are susceptible to numerous risks and the researcher got curious to ensure how WASAC Rwanda projects manage projects risks to adequately achieve to effective implementation of its projects, the findings coincide and reflects the theories and empirical evidence stating that any PPP projects has particular several risks, and project implementers should be skilled and empowered enough as there is no blue print of risks management.

5.3. Suggestions

- The study revealed that several projects in infrastructure water supply project implemented by WASAC Rwanda, normally experience several risks due to the contract structure, working environment and several parties involved in their implementations. It coincide to the views other researchers and empirical findings of studies conducted in other different areas. Thus, the researcher provides a relevant verdict stating that the paramount aspect is to enhance the capacity of risks management for water supply project implementers.

- The study revealed that prior to project implementation, they had been gaps in project design indicated by the fact that the course of project implementation, installation of water pipes faced unexpected other infrastructures like fibres that urged project implementers displacement and reinstallation of fibres .Thus, it urged a supplementary budget that lead to huge amount of costoverrun. Therefore, researcher suggests WASAC Rwanda to effectively design water supply projects to avoid such unexpected tasks and supplementary capital expenditure.

5.4. Suggestions for further research

The researcher cannot claim that the content inherent to this study is exhaustive. As the literature reviews prove that there is scarcity of researcher regarding to project risks management in Rwanda, as the study emphasize on one project with, the researcher suggests the following study for further researcher by considering several projects.

- Impact of project risks management and the performance of construction project in Rwanda.

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APPENDICES

INTRODUCTORY LETTER TO THE RESPONDENTS

Dear,

I am **NDUNGUTSE INGABIRE NICOLE**, a student in University of Rwanda. I am carrying out a research study on **Project Risk management and the Performance of Infrastructure projects in Rwanda. Case of** SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 implemented in **2016-2018.** I request my kind respondents to answer the entire questionnaire by exhausting your opinions; the data provided will be kept confidentially and used purely for the academic purpose. Thank you very much for your assistance.

NDUNGUTSE INGABIRE Nicole

QUESTIONNAIREADDRESSED TO THE EMPLOYEES OF WASAC AND JICA RWANDA.

SECTION A

BACKGROUND INFORMATION

1) **Gende**r

a)Male ☐

b) Female ☐

2) **Age**

a) 21 – 28 ☐

b)29 – 36 ☐

c)37 – 44 ☐

d) 45 – above ☐

3) **Level of education**

a)Bachelor's Degree ☐

b)Master's Degree ☐

c)PhD level ☐

4) **Marital status**

a) Married ☐

b)(Single ☐

c)Widow ☐

5. Position……..

6. Experience ☐

a)Less than 1year ☐

b)Less2-5 years ☐

c)6-10 years ☐

d))Above 10years ☐

SECTION TWO: PROJECT RISK MANAGEMENT AND PROJECT PERFORMANCE

Instructions: Please respond to the questions of your choice by using the corresponding letter(s) as guided;

SA : Strongly Agree

A : Agree **N** : Neutral

D : Disagree with some doubt

SD :Strongly disagree with no doubt

Response code: SA=5; A=4; N=3, D=2, SD=1

PART ONE :RISKS PROBABILITY

STATEMENTS	SA	A	N	D	SD
I.Risk identification					
RISK INHERENT TO PRIVATE SIDE					
Poor contract design					
Accuracy of the project					
The project exerted effective management((Competence of management team)					
High operational costs					
Low quality of raw water					
Corruption					
Water asset condition uncertainty					
The project had Land acquisition risk					
Insufficient private operator performance (operation)					
Raw water scarcity					
Pipeline failures during distribution					
The project experienced effective Provision of resources					
Project implementers had adequate technology					

Inflation due to currency convertibility/ transferability					
Poor performance of subcontractors performance					
Labor cost/availability/supply/performance/productivity					
Completeness &timeliness of project reflects its planning					
The cost of plant was adequate					
Construction resources are not available					
High cost of supply chain					
The cost ascertained to the plant is not affordable					
Construction resources &materials are barely available					
Materials prices(Availability,supply,quality)					
RISKS INHERENT TO PUBLIC SECTOR					
Delay of financial and financial resources					
Political interference					
Non-payment of bills					
Change in government & political opposition					
Political violence/ Government instability					
Delayed payment to subcontractors					
RISKS INHERENT TO BOTH PUBLIC and PRIVATE					
Loss due to foreign exchange rate fluctuation					
Lack of PPP experience					
Conflict between partners					
Construction time & cost overrun					
Unfavorable local/ global economy					
Regulatory risk (weak regulation)					

Force majeure					
Delayed permits insurance					
Accidents and safety					
Delayed claims/dispute resolutions					

PART TWO : RISKS SEVERITY

Instructions: please respond to the questions of your choice by using the corresponding letter(s) as guided;

VS : Very high

S: Severe

M: Moderate

LS : Less severe

PROBABILITY

STATEMENTS	**VS**	**S**	**M**	**LS**
I.Risk identification				
RISK INHERENT TO PRIVATE SIDE				
Poor contract design				
Accuracy of the project				
The project exerted effective management((Competence of management team)				
High operational costs				
Low quality of raw water				
Corruption				
Water asset condition uncertainty				
The project had Land acquisition risk				
Insufficient private operator performance (operation)				
Raw water scarcity				

Pipeline failures during distribution				
The project experienced effective Provision of resources				
Project implementers had adequate technology				
Inflation due to currency convertibility/ transferability				
Poor performance of subcontractors performance				
Labor cost/availability/supply/performance/productivity				
Completeness &timeliness of project reflects its planning				
The cost of plant was adequate				
Construction resources are not available				
High cost of supply chain				
The cost ascertained to the plant is not affordable				
Construction resources &materials are barely available				
Materials prices(Availability,supply,quality)				
RISKS INHERENT TO PUBLIC SECTOR				
Delay of financial and financial resources				
Political interference				
Non-payment of bills				
Change in government & political opposition				
Political violence/ Government instability				
Delayed payment to subcontractors				
RISKS INHERENT TO BOTH PUBLIC and PRIVATE				
Loss due to foreign exchange rate fluctuation				
Lack of PPP experience				
Conflict between partners				

Construction time & cost overrun				
Unfavorable local/ global economy				
Regulatory risk (weak regulation)				
Force majeure				
Delayed permits insurance				
Accidents and safety				
Delayed claims/dispute resolutions				

PART THREE: RISK MANAGEMENT STRATEGIES

Instructions: please respond to the questions of your choice by using the corresponding letter(s) as guided;

SA: Strongly agree

A : Agree

N : Neutral

D : Disagree with some doubt

SD :Strongly disagree with no doubt

Response code : SA=5 ; A=4; N=3, D=2, SD=1

STATEMENTS	**AS**	**A**	**N**	**D**	**SD**
Risk identification strategies					
1.Interview technique is applied to identify project risks					
2..Questionnaire is applied to identify project risks					
3.Observation is applied to identify project risks					
II.Risks analysis					

4.Ranking technique is applied to identify project risks					
5.Evaluation is applied to identify project risks					
6.Impact assessment					
7.Risk probability					
8.Priorization					
III. Risks response					
9.Risk allocation technique is applied in risk response strategy					
10.Risk transference technique is applied in risk response strategy					
11.Risk mitigation technique is applied in risk response strategy					
12.Risk avoidance technique is applied in risk response strategy					
13.Risk acceptance technique is applied in risk response strategy					

PART FOUR: PROJECT SUCCESS

Instructions: please respond to the questions of your choice by using the corresponding letter(s) as guided;

SA : Strongly Agree

A : Agree

N : Neutral

D : Disagree with some doubt

SD :Strongly disagree with no doubt

Response code : SA=5 ; A=4; N=3, D=2, SD=1

STATEMENTS	**SA**	**A**	**N**	**D**	**SD**
1) WATER & SANITATION PROJECT NO: P-RW-F00-016 was implemented effectively					
2). Risks associated to WATER & SANITATION					

PROJECT NO: P-RW-F00-016were effectively managed					
3). WATER & SANITATION PROJECT NO: P-RW-F00-016 met the time required					
4).WATER & SANITATION PROJECTNO: P-RW-F00-016 met its budget					
5) WATER & SANITATION PROJECT NO: P- is RW-F00-016 is sustainable					

V.Relationship between risk management and performance					
6). SUS WATER & SANITATION PROJECT NO: P-RW-F00-016 was well implemented due to effective risk management					
7). There is a relationship between risk management and the performance of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016					

8).How does WASAC cooperate with private constructors (Contract)?

……

……

9). What are other risks facing water supply projects implemented by WASAC in Rwanda?

…….

……..

GUIDED INTERVIEW TO BE ADMINISTRATED TO PROJECT IMPLEMENTERS

1. Do you aware of WATER & SANITATION PROJECT NO: P-RW-F00-016 that was implemented by WASAC?

2. What was the coverage of SUS WATER & SANITATION PROJECT NO: P-RW-F00-016

3. What were the stakeholders that were involved in implementation of WATER & SANITATION PROJECT NO: P-RW-F00-016

4. What are the challenges that WATER & SANITATION PROJECT NO: P-RW-F00-016 faced on the course of its implementation?

5.What are the main risks that are associated with water and sanitations projects

6. What are the risk management strategies used to overcome these projects risks?

7. a)Was SUS WATER & SANITATION PROGRAM NO: P-RW-F00-016 implemented effectively?

b) What are indicators of its success?

8. Apart from the challenges faced on the course of this project, what are other problems you frequently face when you are collaborating with Public institutions?

9. What are your suggestions to prevent such problems?

Thank you very much!