EFFECTS OF RISK MANAGEMENT METHODS ON PROJECT PERFORMANCE IN RWANDAN CONSTRUCTION INDUSTRY

A CASE STUDY OF MULTI-STOREY BUILDINGS CONSTRUCTION PROJECT OF RSSB

SIBOMANA Aimable

A research project submitted to the Department of Entrepreneurship, Technology, Leadership and Management in the School of Entrepreneurship, Procurement and Management in partial fulfillment of the requirements for the award of Master degree of Science in Project Management at Jomo Kenyatta University of Agriculture and Technology (Kigali Campus).

2015

DECLARATION

This Research project is my original work and has not been presented for a degree in any other University

Signature…….. Date ……..

SIBOMANA Aimable

This Research project has been submitted for examination with my approval as University Supervisor

Signature …… Date …….

Dr. JAYA SHUKLA

Signature…….. Date…….

Joseph ODUOR

DEDICATION

My Family,

This Research project is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time. Today I dedicate them this important achievement, without their presence, support and comprehension I would have not achieved my goal.

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Throughout my personal and professional experiences, I have given the opportunity to wish and dream through my life. I have reached my professional goals, not only because of my innate abilities, but because I have had the opportunity of meeting wonderful human beings that have contributed to my life with knowledge, words of support and motivation.

First of all I thank you God, for life, health, and the energy that you have given me to reach my professional goals. Secondly I thank RSSB management for financial support and other vital benefits offered to me during this path, may the Lord bless them abundantly.

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ABSTRACT

Risks are very common in construction sector. Risk is the Possibility of suffering loss and the impact on the involved parties. According to APM (2006), all projects are inherently risky because they are unique, constrained, complex, based on assumptions, and performed by people. As a result, project risk management methods must be built into the management of projects and should be used throughout the project lifecycle.

Many construction projects fail because organizations assume that all the projects would succeed and they therefore do not identify, analyze, and provide mitigation or contingencies for the risk elements involved in the project.

Society desires that all projects should be performing and has become less tolerant of failure (Edwards and Bowen, 2005). Pressure is exerted on project managers to minimize the chance of project failure. This increasing pressure for performance which suggests that it is prudent for anyone involved in a project to be concerned about the associated risks and how they can be effectively managed.

Traditionally, performance of a project is analyzed on the criteria of quality, budget and time of completion. Two more criteria to determine the performance of a project were added by Kerzner (2001). Firstly, the project would effectively and efficiently manage risks and, secondly, it should be accepted by the customer.

It is known that the cause of the projects failure can be directly related to the extent of risk management methods undertaken. Besides, the level of risk management methods undertaken during project lifecycle impacts directly on the performance or otherwise of the project. Furthermore, using risk management methods effectively to manage risk should be continuously undertaken throughout the project lifecycle to enhance project performance. Risk management methods are thus an important tool to cope with such substantial risks in projects performance.

The main objective of the enquiry work that underpins this research is to investigate the effect of risk management methods on project performance. In this paper, a case study of RSSB multi-storey already executed project is considered.

LIST OF ACRONYMS

EDPRS: Economic Development and Poverty Reduction Strategy
FIDIC: The international Federation of Consulting engineers
HRBS: Hierarchical risk breakdown structure
MCS: Monte Carlo Simulation
PERT: Program Evaluation Review Technique
PLC: Project life cycle
PMBOK: Project Management Body of Knowledge
PMI: Project Management Institute
RAMA: Rwanda Health Insurance
RBS: Risk breakdown structure
RM: Risk management
RMP: Risk Management Process
RSSB: Rwanda Social Security Board
SOW: Statement of work
SSFR: Social Security Fund of Rwanda
SPSS: Statistical package for social science
WBS: Work Breakdown Structure

DEFINITION OF TERMS

Key words: Risk; Risk management, Risk management methods, Project performance and Project life cycle.

Client – a part that carries out or assigns others to carry out construction, demolition or land work (PBL 1987).

Contractor – a performing organization whose employees are most directly involved in doing the work on the project (PMI 2000).

Project: a unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constrains of time, cost and resources (IEC 2001).

Project life cycle: a collection of generally sequential project phases whose name and number are determined by the control needs of the organization or organizations involved in the project (PMI 2000).

Project risk: an uncertain event or condition that, if occurs, has a positive or a negative effect on a project objective (PMI 2000).

Risk: an implication of significant uncertainty, which may be upside and downside (Chapman and Ward 2002).

Risk management: a systematic process of identifying, analyzing and responding to project risks (PMI 2000).

Risk assessment: a process of assessing the impact and likelihood of identified risks (PMI 2000).

Risk response: a process of selection and implementation of measures to modify risk (IEC 2001).

Uncertainty – a lack of certainty, involving variability and ambiguity (Chapman and Ward 2002).

CHAPTER 1

INTRODUCTION

1.1. Background of the study

In 2011, the Government of Rwanda created Rwanda Social Security Board (RSSB) to manage the Social Security Fund of Rwanda (SSFR) scheme and Rwanda Health Insurance (RAMA) scheme together for social security coverage. RSSB's mandate is to cover Social Security service within the country, it has also a legal and fiduciary obligation to act in the best financial interest of the Fund's beneficiaries and to exercise the highest standard of care in taking initiative to invest in projects that are eligible for the institution to offset obligations by fund's investment earnings in long term.

RSSB, most important funding in its day to day operations is members' contributions and Investment earnings; therefore, strategic management to strengthening organization performance is vital to all of the fund's stakeholders.
In order to cope better with the strong emerging urban demand, RSSB aligned with the Rwanda Housing Authority to facilitate the implementation of the Vision 2020 goals and EDPRS targets of developing the housing sector, real estate promotion and construction of public buildings.

The objectives of the such projects are to provide high quality, standardized working space for RSSB district branch staff and any other interested renters, to extend RSSB services nearer to its clients, to improve on the RSSB's coverage ratio nationwide, to get a good and sizable return on invested funds in this Real Estate venture and last but not least to contribute to the economic development in all districts across the country.

The projects have a vision of enabling the RSSB be the leading pension fund service provider by reaching out to the whole of Rwanda, the region and the entire world as well as providing a comfortable and desirable working environment for all stakeholders (staff and other renters) in all districts across the country.

In order to examine how risks management problem lead to negative effect to construction project, all analysis are made based on a theoretical background regarding risk, risk management

methods and project life cycle approach in multi storeyed buildings project. Based on conducted interviews, this report presents how risks change during a project life cycle and the effect of risk methods on the performance of the project.

The purpose of this Research project is to evaluate the effects of risk management methods and how are they being applied in multi storey buildings project towards the performance of a construction project and how the project manager is managing risks by using the appropriate methods in everyday operations. The theory of the risk management process will be compared to the actual methods in practice in order to investigate similarities and differences. In other words, the main idea is to see if the project is working with risk management approach as it is described in the literature regarding the methods and techniques.

The research for this Research project will be conducted in Rwanda social Security Board with a variety of projects in progress notably Multi storey buildings project.
This project works with risks in a way that stakeholders are aware of risks. However, they believe that a project's performance can be improved by implementing risk management methods. The company was chosen in order to investigate or to assess the methods, practices and applicability of risk management principles across Multi storey Project.

The report starts with a literature overview in order to provide the theoretical context about the construction industry and how it operates in the field of risk management with focus on the project life cycle. Subsequently, results from conducted interviews will be presented to show how the Multi storey project worked with risks. In the discussion part, the results from the questionnaires are analyzed and compared to the theoretical framework. Finally the final recommendations are drawn up in the conclusion.

1.2.Problem statement

Embarking on a construction project involves taking risks, and no one in the construction project will be free from risk. No matter how small or simple is the project it is still can go wrong as soon as the two parties, the client and the contractor signed a contract they have taken onboard the risk (Sawczuk, 1996). The individual in the construction industries that undertake various

activities are heterogeneous since client; consultant and contractors have different roles and objectives (flanagan, 1995).

Many projects suffer overrun in cost, delayed schedule, failure and even abandonment. They may equally not meet the quality specifications or may not achieve the benefits for which they were embarked upon. The cost of failure makes it important to understand what makes a project successful.

Traditionally, successful project management is analyzed on the criteria of performance/ quality, budget and time of completion. Two more criteria to determine the performance of a project management were added by Kerzner (2001). Firstly, the project would effectively and efficiently manage risks and secondly, it should be accepted by the customer.

According to APM (2006), all projects are inherently risky because they are unique, constrained, complex, based on assumptions, and performed by people. As a result, project risk management must be built into the management of projects and should be used throughout the project lifecycle. Many projects fail because organizations assume that all the projects would succeed and they therefore do not identify, analyze, and provide mitigation or contingencies for the risk elements involved in the project. This is especially true with the rapid change and increased competition.

Risk within the construction industry is generally perceived as an occurrence that impacts the major objectives of projects, namely cost, time and quality. The other fact is that the construction industry is more prone to risk and uncertainty than any other sector of the economy (Tah& Carr 2000; Othman 2008). This could be due to the inherent idiosyncrasies of the construction sector, such as considerable complexity, dynamic nature vulnerability to project environment, tight scheduling and the immense size and volume of the projects. The impacts of these factors are further exacerbated due to the involvement of a wide range of stakeholders and parties at every stage of the product delivery. Projects risks might influence every aspect of a project to the extent that these risks could hamper meeting the main objectives of the project (Tadayon et al. 2012).

As a result, the performance of construction projects lies in effectively managing the risks involved. The pivotal role of risk management for construction projects has been under-pinned by Baloi and Price (1976, p. 262), who postulated that there is a direct relationship between

effective risk management methods and project performance since risks are assessed by their potential effect on the objectives of the project. Thus risk management methods are the process aimed at controlling the level of risks and modifying the concomitant effects (Uher & Toakley 1999). However, some studies (Dwivedula & Bredillet 2010; Tummala & Schoenherr 2011) have stated that risk management domain should not be confined to mitigating and controlling risks but should target avoiding the identified risk. Complying with Fan et al. (2008), for the purpose of this study, risk management is considered as the whole activities geared towards spotting risky situations, along with developing the strategies to reduce the probability of occurrence and impacts of risks.

So, this Research project **"Effects of risk management methods on project performance in Rwandan construction industry; a Case study of RSSB Multi storey buildings projects of *RSSB***" intends to assess the effects of risk management methods towards the project performance in Rwandan construction industry.

According to Burchett (1999), risk in construction, however cannot be eliminated, but it can be minimized, transferred or retained. However, the industry has a very poor reputation for managing risk, with many projects failing to meet deadlines and cost.

In practice, normally in order to deal with the unexpected event, there will be an allocation about 10 percent from the estimated cost of the proposed construction project as a contingency sum. Earlier observation shows that the risk management process is not widely being implemented in Rwandan construction industry. For this reason, this research seeks to identify particularly the barriers and challenges for the implementation of risk management methods in RSSB construction project.

1.3. Objectives of the study

1.3.1. General objectives

The aim of this Research project is to assess the "Effects of risk management methods on project performance in Rwandan construction industry; with the case study of multi-storey buildings construction project of RSSB".

1.3.2. Specific objectives

1. To study the effects of risk avoidance or prevention on the performance of construction project in the Rwandan industry
2. To assess the influence of risk control (loss control) on the project performance in Rwandan construction industry
3. To evaluate the effects of risk retention on the project performance.
4. To analyze the influence of risk transfer on the project performance in Rwandan construction industry

1.4. Research questions

In order to achieve the objectives, the following research questions have been formulated to support the investigation:

1. What are the effects of risk avoidance or prevention on the performance of a construction project in the Rwandan industry?
2. How does risk control (loss control or risk mitigation) influence the project performance in Rwandan construction industry?
3. Are there the effects of risk retention on the project performance?
4. How does risk transfer influence the project performance in Rwandan construction industry?

1.5. Justification

This Research project has assessed the influence of risk management methods on the performance of a construction project and deeply has analyzed how its use affects the performance of construction projects vis-à-vis the inherent risks and specifically we had focused on RSSB's projects of constructing the Multi storey across the country.

The theory of risk management process has been compared to the actual methods in practice in order to investigate similarities and differences. In other words, the main idea is to see if the said projects are working with risk management approaches and if its use influences the performance of a project.

The recommendations and findings on use of suitable risk management techniques as an aid to project performance will be useful for the success of future RSSB construction projects.

1.6. Scope of the study

The research starts with a literature overview in order to provide the theoretical context about the project organization in general with the focus on the project life cycle. Risk management methods including the definition of risk, a descriptive part of the steps of risk management methods is then presented. Further, a description of how the construction industry is operating in the field of risk management is also provided in order to establish the foundation for this report. Subsequently, results from conducted interviews are presented to show how the project works with risks. In the discussion part, the results from the interviews and questionnaire are analyzed and compared to the theoretical framework. Finally the final recommendations are drawn up in the conclusion section.

1.7. Limitation

The study focuses on the construction industry and is based on theories of risk management methods described in the literature.

In most cases, the researcher has confronted with a number of problems while conducting this research. The limitation of this study has been mainly the one associated to subjectivity and feeling of responses where respondents viewed the research as forward exercise and purely academic work; hence they give responses without facts and evidence. On the other hand respondents could fear to exhaust the required information for the fact that the topic is sensitive to project's team performance (RSSB Multi-storey project).

CHAPTER 2

LITERATURE REVIEW

2.1.Introduction

The theoretical part of this report is mainly divided into four parts. The first part is a conceptual framework. Its purpose is to review the linkage of literature review to the research objectives and questions; it will indicate what has been done by other researchers including the methodologies used and identify gaps. It shows also the hypothesized variables that would help in analysis.

The second part is about the critiques of effects of risk management methods used in construction industry as an important issue in order to achieve project objectives in terms of performance. The third part concerns the summary of the study and the fourth part is about the research gaps.

2.2. Conceptual framework

Designing and using a compiled system for managing and decreasing the available risks and expenses in the way of implementation of RSSB Multi storey project will have profitable results for successful finishing of project by paying attention to the cost, time and attracting the positive idea of project beneficial with itself. It's a long time which this is the duty of risk management techniques but it's a short time that these techniques enter to the field of project management.

The profitability and efficiency of projects risk management system is confirmed by the majority of risk management experts Michael Ropel (2011). In this research we have tried to paying attention to the dimensions of construction projects risk management methods and its influence on project performance by introducing the system of projects risk management methods based on PMBOK guidelines and its application vis-à-vis to RSSB multi storeyed buildings project.

Then we had presented the proposal framework based on this standard. We had also presented some suitable operational solutions for recovering of time and expense simultaneously by using the framework of risk management methods for construction projects. We did that work also for evaluation of proposal system of the results of function before and after implementation of measured model which had some desired results.

This study has independent, dependent and intervening variables as represented in the following figure:

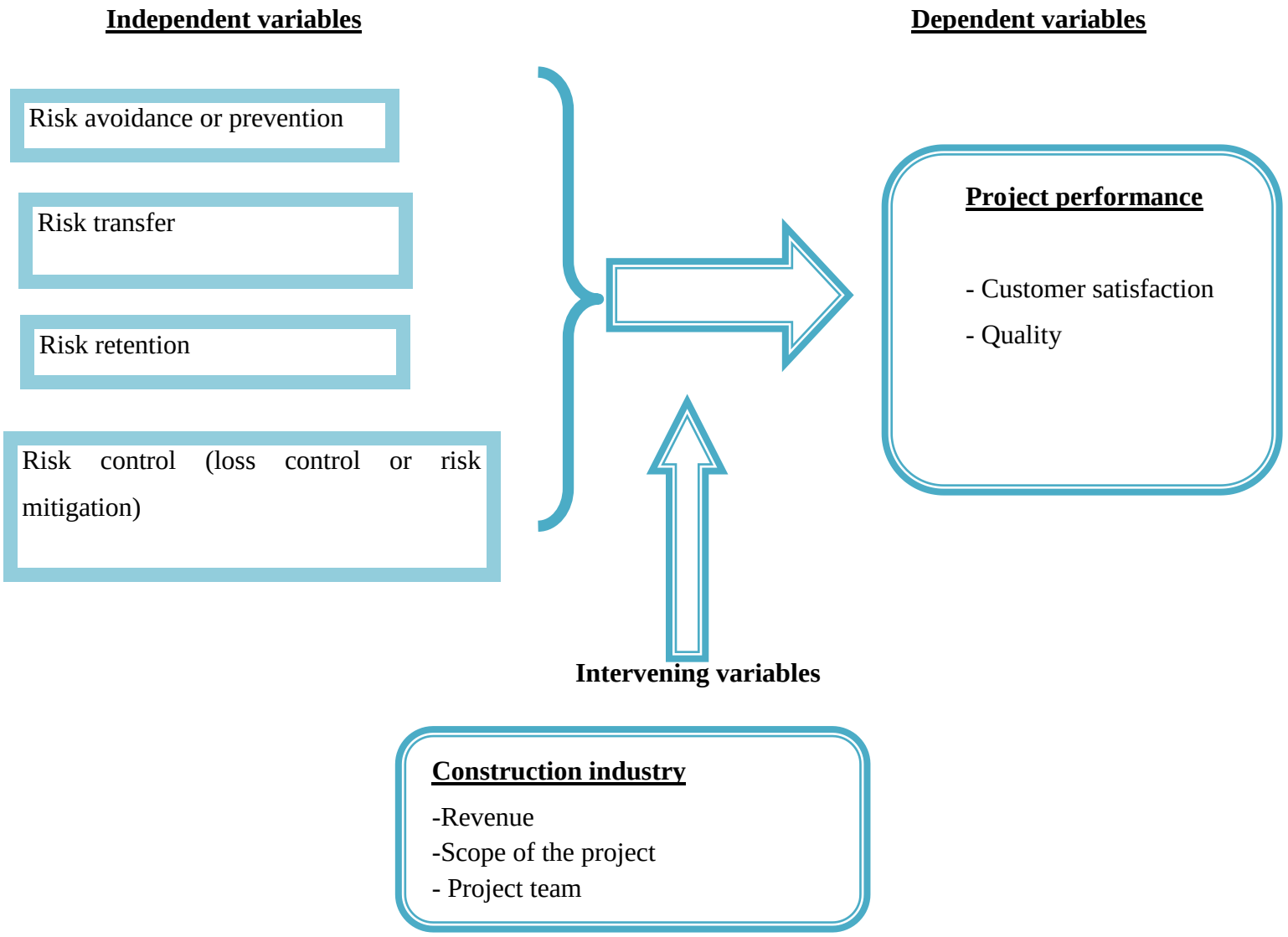

Figure 1: conceptual framework

2.3. Concept of risk management methods

As per John Walewski (2003), no standard definitions or procedures exist for what constitutes risk management methods. In the construction industry, risk is often referred to as the presence of potential or actual treats or opportunities that influence the objectives of a project. Risk is also defined as the exposure to the chance of occurrences of events adversely or favorably affecting project objectives as a consequence of uncertainty.

It is well accepted that risk can be effectively managed to mitigate its adverse impacts on project objectives, even if it is inevitable in all project undertakings. The source of risk includes inherent uncertainties and issues related to the company's fluctuating project margin, competitive bidding process, job site productivity and the political situation, inflation, contractual rights, and market competition, etc. Rezakhani (2012)

Pejman (2012) stipulated that, it is important for the construction companies to face these uncertain risks by assessing their effects on the project objectives because a risk quantitative method allows deciding which of the project is more risky, planning for the potential sources of risks in each project, and managing each source during construction. It is important that risk is distinguished from uncertainty. The one is measurable uncertainty, the other is immeasurable risk.

Therefore, methods for managing risks involve Risk avoidance or prevention, Risk control (loss control or risk mitigation) Risk transfer and Risk retention.

2.3.1. Risk avoidance/prevention

If the risk is classified as bringing negative consequences to the whole project, it is of importance to review the project's aim. In order words, if the risk has significant impact on the project, the best solution is to avoid it by changing the scope of the project or, worst scenario, cancel it. There are many potential risks that a project can be exposed to, and which can impact success (Mikaela,2011).This is why risk management is required in the early stages of a project instead of dealing with the damage after the occurrence of the risk (PMI,2004).

The avoidance means that by looking at alternatives in the project, many risks can be eliminated. If major changes are required in the project in order to avoid risks, Ropel (2011) suggest applying known and well developed strategies instead of new ones, even if new ones may appear to be more cost efficient. In this way, the risks can be avoided and work can proceed smoothly because strategy is less stressful to the users.

2.3.2. Risk control or reduction/mitigation

By having an overview over the whole project it is easy to identify problems which are causing damage. In order to reduce the level of risk, the exposed areas should be changed (Michaela, 2011).This is a way of minimizing the potential risks by mitigating their likelihood (Ropel,

2011).One way to reduce risks in a project is to add expenditures that can provide benefits in the long term. Some projects invest in guarantees or hire experts to manage high risk activities. Those experts may find solutions that the project team has not considered (Mikaela, 2011).

Those risks which should be reduced and also be shared with parties that have more appropriate resources and knowledge about the consequences (Ropel, 2011).Sharing can also be an alternative, by cooperating with other parties. In this way, one project team can take advantage of another's resources and experience. It is a way to share responsibilities concerning risks in the project (Ropel, 2011).

2.3.3. Risk transfer

If a risk can be managed by another expert who has a greater capability or capacity, the best option is to transfer it. Michaela states that the risk should be transferred to those who know to manage it. Risks can be transferred to the client, contractor, subcontractor, designer etc, depending on the risk's character. As a result this could lead to higher costs and additional work, usually called risk premium.
It must be recognized that the risk is not eliminated; it is only transferred to the party that is best able to manage it (PMI, 2004).

Shifting risks and the negative impacts they bring is also an option when the risks are outside project management's control, for example political issues or labor strikes (Ropel, 2011).The situation may also consist of catastrophes that are rare and unpredictable in a certain environment. Such risks that are beyond the management's control should be transferred through insurance companies.

2.3.4. Risk retention

When a risk cannot be transferred or avoided, the best solution is to retain the risk. In this case the risk must be controlled, in order to minimize the impact of its occurrence (Mikaela, 2011).Retention can also be an option when other solution is uneconomical (Mikaela, 2011).

2.4. Risk management methods critiques

In the risk management process (RMP) as the basic principle of understanding and managing risks in a project, the main phases: identification, assessment, analysis, and response should not be seen as the only factors to manage risks, Ropel (2012).

All steps in RMP should be included when dealing with risks, in order to efficiently implement the process in the project. There are many variations of RMP available in literature, but most commonly described frameworks consist of those mentioned steps. In some models there is one more step added, and the majority of sources identify it as risk monitoring or review. For the purpose of this report the model of RMP described by Michaela (2011) consist our main critiques and therefore will be well explained in the supplementary analysis and will be further explained in the following section.

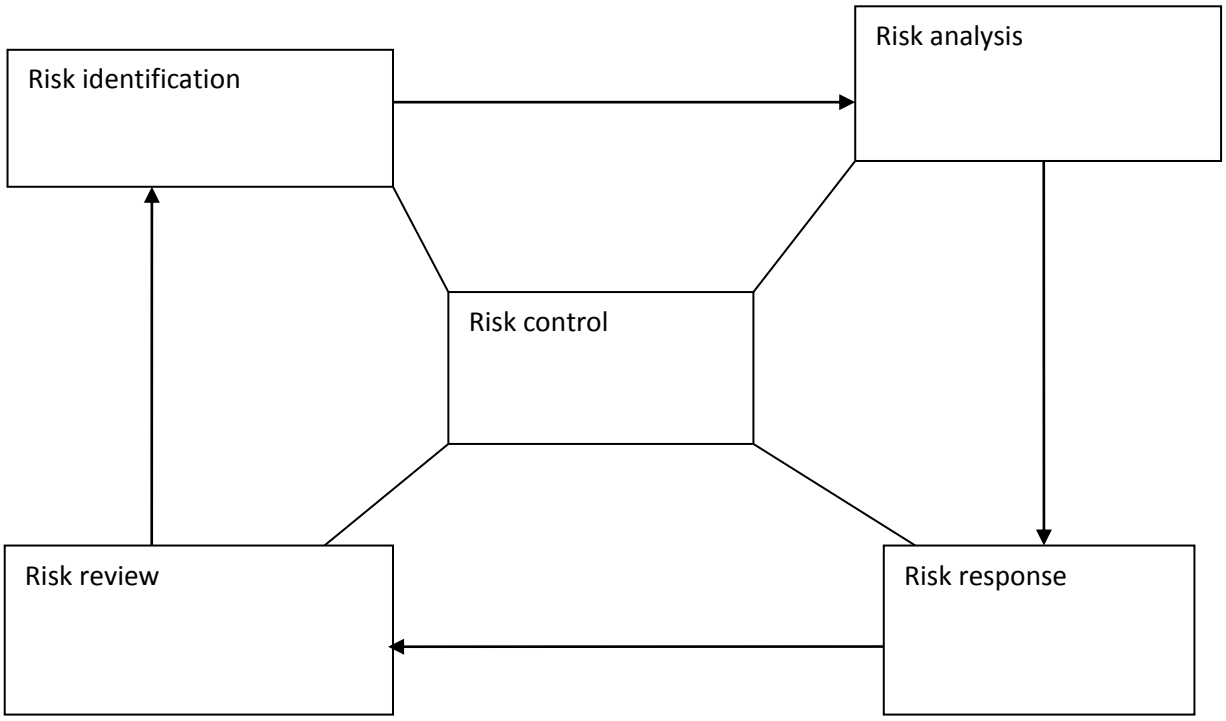

Figure 3: The process of managing risks by Michaela Ropel (2011)

2.4.1. Risk identification

By Pejman (2012) identifying risk is the first step in the Risk Management Program (RMP) usually informal and can be performed in various ways depending on the organization of the

project team. It means that the identification of risks relies mostly on past experience that should be used in upcoming projects.

In order to find the potential risks, an allocation needs to be done. This can be decided and arranged by the organization step which determines which risk components may adversely affect which project objectives and documents their characteristics. Construction risks are classified in many ways by risk types (i.e., natures, and magnitudes, etc), the sources and/or origins, or project phase. Some of the existing researches propose a hierarchical structure of risks which classifies the risks according to their origin and the location which the risk impacts to the project.

Risks and other threats can be hard to eliminate, but when they have been identified, it is easier to take actions and have control over them. If the causes of the risks have been identified and allocated before any problems occur, the risk management will be more effective (PMI, 2004). Risk management is not only solving problems in advance, but also being prepared for potential problems that can occur unexpectedly. Handling potential threats is not only a way to minimize losses within the project, but also a way to transfer risks into opportunities which can lead to economical profitability, environmental and other advantages (Ropel 2011).

The purpose of identifying risks is to obtain a list with potential risks to be managed in a project (PMI,2004).In order to find all potential risks which might impact a specific project, different techniques can applied. It is important to use a method that the project team is most familiar with and the project will benefit from. The aim is to highlight the potential problems, in order for the project team to be aware of them (MikaelaRopel, 2011).

2.4.2. Risk assessment

Assessing is the second step where collected data about potential risk are analyzed. Risk analysis can be described as short listing risks with the highest impact on the project by quantifying their occurrence rates. In the analysis of the identified risk, two categories of methods (qualitative and quantitative) have been developed. The qualitative methods are most applicable when risks can be placed somewhere on a descriptive scale from high to low level. The quantitative methods are used to determine the probability and impacts of risk identified and are based on numeric estimation (Nerija, 2012). There are many factors which should be considered when a project risk manager select a risk assessment method as per the cost of employing the technique, the

level of external party's approval, organizational structure, agreement, adoptability, complexity, validity, and credibility and automation. It is essential for the risk manager to have high quality data in order to effectively apply the quantitative methods, even if it is not easy to obtain such high quality data relative to risk items in the construction industry.

The difficult is attributed to address the uncertainties and subjectivities associated with construction activities. Beside the lack of collectability, the uniqueness, and non-repetitive nature of construction projects impeded using probabilistic risk quantification approaches. Pejman (2012) companies tend to use qualitative approach since it is more convenient to describe the risks than to quantify them (Michaela, 2011). In addition, there is also a semi quantitative technique to allow some relative risk ranking, but these techniques are still unable to provide detailed assessment of large and complicated projects or systems. It is difficult to control or mitigate the risks solely using qualitative risk assessment.
A combination of qualitative and quantitative risk assessment is beneficial to successfully identifying the risks associated with the project while controlling the cost, time, and resources (tarkumar shah, 2004).Although qualitative method helps with understanding the process, and it is highly recommended as an initiation of the risk management process irrespective of the fact that qualitative risk analysis is going to be done (Tarkumar shah, 2004).

In summary, the objective of this report is to develop the methods of managing risk through risk assessment frameworks and probability risk assessment model. The methods will be applied to Multi storey Estate project application and help to prioritize the risks within the company. Design of controls will be based on prioritization of risks which will help to manage the risks within the project to an acceptable level.

2.4.3. Risk response

The third step of the Risk Management Process (RMP) indicates what action should be taken towards the identified risks and threats. Responding risks is involved in developing options and/or actions to enhance opportunities to achieve the project objectives Pejman (2012). Risk response can be considered one of the main risk management process outputs along with risk planning Mohammed (2013).This is what defines a successful risk management process implementation since it provides contractors with the backup plans, contingencies, and corrective actions to be taken in case of the risk occurrence or a preventive action to prevent the

materialization of the risk in the first place. This depends on the adopted risk response strategy, whether to reduce the exposure of the risk or prevent it. It is worth noting that the risk response strategy is the larger aspect of the risk response stage, which leads to risk response techniques to be developed according to the project's complexity and conditions. Hashem (2013).Several authors have identified different risk response strategies. The PMBOK (2004) listed the following strategies or techniques for managing risks in the construction projects; avoid (extending schedule, reducing scope, shutting down the project),transfer (Financial risk exposure, insurance, warranties, guarantees);mitigate(taking early actions, adopting less complex processes, conduction of more tests, choosing more stable supplies, prototyping, redundancy),or accept(passive acceptance: no action except to document the strategy and leave it to the project team to deal with it; active acceptance: establishing contingency reserve for money, time, and resources Mohammed S.(2013).

Project management institute requires that risk needs to have a supervisor to monitor the development of the response, which will be agreed by the actors involved in this risk management process. Most common strategies for risk responses are: avoidance, reduction, transfer and retention (Ropel, 2011).

2.4.4. Monitoring and Reviewing Risks

Finally, monitoring and reviewing risks is to implement a risk response plan, to keep tracking of the risks identified, to monitor residual risks, to identify new risks, and to evaluates the effectiveness of the project risk management process. Rezakhani (2012).

R.C. Walke et al (2011) recognized that risk monitoring and control is a process where effectiveness of the responses is monitored and controlled at the same time, identification and analysis of newly arising risks is done at this stage. For this step each engineering expertise should use specialized risk management tool as presented in Table 1 for risk analysis depending on project phase.

Discipline	Planning/ Programming	Preliminary Engineering	Final Design	Construction
Planning	●	●	○	
Environmental	●	●	○	○
Funding Approval	●	●	○	
Project Management	●	●	●	●
Engineering	●	●	●	●
Civil, Structural, Systems	○		●	●
Cost Estimating	○	●	●	●
Scheduling	○	●	●	●
Budgeting Controls	○		●	○
Real Estate/Right of Way	○	●	●	○
Construction Management/Oversight	○	○	●	●
Constructability/Contractor	○	○	○	●
Other Technical (e.g. Legal, Permitting, Procurement)	○	●	●	●
Risk Facilitation	●	●	●	○

Table 1: Key expertise for risk analysis by project phase, (PejmanRezakhani (2012).

●Highly desirable; ○ Desirable but optional depending upon circumstances.

2.5. Research gaps

2.5.1. Limited risk management methods

The risk management methods which have effects on the performance of a project in Rwandan construction industry omit some of the techniques for effective risk management methods to the better performance of a project. Following are the handy techniques in question:

- **Qualitative methods for risk assessment techniques**

Qualitative risk analysis assesses the impact and likelihood of the identified risks and develops prioritized lists of the risks for further analysis or direct mitigation. Nerija (2012) introduced a

hierarchical risk breakdown structure (HRBS) and the HRBS represents a formal model for qualitative risk assessment. Qualitative analysis involves more sophisticated techniques and methods to investigate and analyze construction project risks. Quantitative risk analysis attempts to estimate the frequency of risks and the magnitude of their consequences by different methods such as the decision three analysis allows the construction project exposure to be modeled, and quantifies the probability of occurrence of the identified risk factors as well as their potential impact.

Various risk management tools are available and fortunately they are suitable for many industries, organization and projects Audrius (2012). Although today's organization appreciate the benefits of managing risks in construction projects, formal risk analysis and management techniques are rarely used due to lack of knowledge and to doubts on the suitability of these techniques for construction projects.

There are four alternative strategies, risk avoidance, risk transfer, risk mitigation, and risk acceptance for treating risks in a construction project. As stated by Audrius (2012), risk mitigation and risk response development is often the weakest part of the risk management process.
The proper management of risks required that they be identified and allocated in a well-defined manner. This can only be achieved if contracting parties comprehend their risk responsibilities, risk event conditions, and risk handling capabilities.

- **Risk probability and impact assessment**

By Ropel 2011 applying the method called risk probability and impact assessment, the likelihood of a specific risk to occur is evaluated. Furthermore, risk impact on a project's objectives is assessed regarding its positive effects for opportunities, as well as negative effects which result from threats. For the purpose of this assessment, probability and impact should be defined and toiled to a particular project (PMI, 2004).This means that clear definitions of scale should be drawn up and its scope depends on the project's nature, criteria and objectives. PMI (2004) identifies exemplary range of probability from very unlikely to almost certain; however, corresponding numerical assessment is admissible. The impact scale varies from 'very low' to 'very high'. Each risk listed under the identification phase is assessed in terms of the probability and the impact of its occurrence (PMI, 2004).

- **Probability/impact risk rating matrix**

Probability and impact which were assessed in the previous step are used as basis for quantitative analysis and risk response which will be explained further in this report. For this reason finding from the assessment are prioritized by using various methods of calculation which can be found in the literature (PMI, 2004).Michaela (2011) computes the priority score as the average of the probability and impact. The range of priority score, the rating and color are assigned to indicate the importance of each risk (Ropel, 2001).In order to set priorities, impact is multiplied by probability. The compiled results are shown in the matrix (PMI, 2004).

Such combination of factors indicates which risks are of low, moderate or high priority. Regardless of the calculation method chosen, such a combination of data shows priority of previously identified risks by use of corresponding colors or numerical and helps to assign appropriate risk response. For instance, threats with high impact and likelihood are identified as high risk and may require immediate response, while low priority score threats can be monitored with action being taken only if, or when, needed(PMI,2004). The basic form of risk impact/probability chart is shown below:

Figure 4: Risk impact/Probability chart, Risk Management Program (2009)

- **Risk categorization, and Risk Urgency Assessment**

Two methods mentioned by PMI (2004) are not as commonly used as probability and impact. Risk categorization is a way of systematizing project threats according to their sources ,in order to identify areas of the project that are most exposed to those risks. Tools which can be used in this method are work break down structure (WBS) or risk breakdown structure (RBS),and their role is to develop effective risk response (PMI,2004).WBS breaks down large activities into small manageable unit and creates linked, hierarchical series of independent activities (Mikaela,2011). RBS categorizes risks and shows their dependencies (Ropel, 2011).The role of the second method, Risk Urgency Assessment, is to prioritize risks according to how quick response they require. Lists with risks prioritized by applying qualitative methods, can be used to bring attention to significant problems to the project. Problems that are classified as a medium level risks can be a subject of a quantitative analysis to have better control over them. The threats that are assessed as low impact can be placed on a watch list and monitored. It will allow the project team to focus on more important issues. Risk categorization helps reveal the weak links in the project organization where more attention should be directed (PMI, 2004).

2.5.2. Lack of risk management methods in the early project life cycle

The literature in place has identifies project steps where more attention should be directed toward risk management. In the initial project phase, the feasibility study must be undertaken, which is a thorough analysis of a project proposal. At this stage, a number of solutions are identified and assessed and the study is conducted to identify potential risks associated with proposed solutions. Further in the planning phase, a risk plan should be drawn up where potential risks related to project planning are identified. All the stakeholders should contribute in drawing up this plan to make sure that every potential risk has been identified. In addition to identifying risk, the risk plan assigns the type of action which should be taken in order to respond to a particular problem. Performing this stage in the planning phase aims at mitigating risk before the execution phase, during which any occurring risk is very costly if no action is taken in advance.

Ropel (2011) did not suggest that risk assessment should also be performed during the review of each phase of the project. At the beginning of a project, a high level of uncertainty is expected which decreases along with project progress. Doubts which rise at any point make it necessary to

go back and revise controversial issues from their origin. Such a procedure will require going back to previous steps and discussing them with the new assumptions. While making decisions while moving further in the project raises a need for adjustments in previous steps. In other words, decisions made at a certain point of time may result in changing concepts of steps further up in the project which were made at the initial phase.

In the execution phase of the project, monitoring and control are performed in order to make sure that the process is going according to the plan and all identified risks are being handled. Such monitoring should be done under the whole project process, starting with the point in time when the risks were recognized. At the project closure, where the whole project is summarized, the project's objectives, benefits and deliverables are evaluated. All parties then have a chance to list all activities or risks which were not fully managed within the project. Those unmanaged risks can be a subject of further discussion and be used as warning for next projects (Michaela, 2011).

2.5.3. Risks in construction projects

Managing risks in construction project should be recognized as very important in order to achieve project objectives in terms of time, cost and quality. Due to the nature of the construction sector, risk management is a very important process. It is most widely used in those projects which include high level of uncertainty.

These types of risk investments are characterized by more formal planning, monitor and control processes. The easiest way to identify risk is to analyze and draw a conclusion from projects which failed in the past.

To make sure that the project objectives are met, the portfolio of risks associated with all actors across the project life cycle should be considered (Nerija and Banaitis, 2012). In the early stages of the project where planning and contracting of work, together with the preliminary capital budget are being drawn, risk management procedures should be initiated. In later stages, risk management applied systemically, helps to control those critical elements which can negatively impact project performance. In other words, to keep track of previously identified threats, will result in early warnings to the project manager if any of the objectives, time, cost or quality, are not being met (Michaela, 2011).

There are a number of risks which can be identified in the construction industry and which can be faced in each construction project regardless of its size and scope. Changes in design and scope along with time frames for project completion are the most common risks for the construction sector. Further in the process, changes in scope or design are implemented, the more additional resources, time and cost, those changes require. Project completion ahead of time may be as worrying as delays in a schedule. Too quick completion may be a result of insufficient planning or design problems which in fact shorten the completion time but on the other hand lead to a low quality of final product and increased overall cost. Being behind schedule generates greater costs for both investors and contractors due to non-compliance with contracted works (Ropel, 2011). And thus it is important to keep a balance in the concept of time-cost-quality tradeoff, which more widely is becoming an important issue for the construction sector (Michaela, 2011). Depending on the project scope, types of risks may differ among investments. Thus, a more detailed risk identification analysis for the construction sector is an added value to the performance of the project.

CHAPTER 3

RESEARCH METHODOLOGY

3.0. Introduction

The research methodology describes the research methods and techniques employed in the study. It includes research design, area of study and population or sample size. It includes sampling procedure, data collection methods, secondary data sources, validity and reliability of instruments, and data analysis as well as ethical considerations.

3.1.Research Design

The researcher has used a descriptive research design, where qualitative and quantitative approach has been used. In quantitative approach the research has employed data in form of numbers collected from Multi storey buildings project team. According to Kothari (2008), research design is the conceptual structure within which research is conducted, it constitutes the blueprint for the collection, measurement and analysis of data as such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data.

3.2. An overview of multi storey buildings as the case study

Geographically, this study is limited to the 4 Districts multi storey buildings of RSSB. These District buildings are located respectively in NYANZA, MUSANZE, KARONGI and RWAMAGANA districts.

In order to cope better with the strong emerging urban demand, RSSB aligned with the Rwanda Housing Authority to facilitate the implementation of the Vision 2020 goals and EDPRS targets of developing the housing sector, real estate promotion and construction of public buildings.

The objectives of the such projects are to provide high quality, standardized working space for RSSB district branch staff and any other interested renters, to extend RSSB services nearer to its clients, to improve on the RSSB's coverage ratio nationwide, to get a good and sizable return on invested funds in this Real Estate venture and last but not least to contribute to the economic development in all districts across the country.

The projects have a vision of enabling the RSSB be the leading pension fund service provider by reaching out to the whole of Rwanda, the region and the entire world as well as providing a comfortable and desirable working environment for all stakeholders (staff and other renters) in all districts across the country.

RSSB in promoting this investment also has a mission of providing high quality, comfortable, affordable and well-designed state of the art office blocks for the RSSB decentralized district and any other interested renters to occupy the rest of the buildings. There is also an intention of yielding high returns that will accrue from this project.

3.3.Target Population

The case study of this research is Multi storey buildings, a project of RSSB in 4 Districts. The research has concerned 291 as the target population whom constitute the entire project team; and from October 2010 to date. According to Kothari (2004) all the items under consideration in any field of inquiry constitute a 'universe' or 'population'. It can be presumed that in such an inquiry when all the items are covered no element of chance is left and highest accuracy is obtained.

3.4. Sampling frame

A sample design has helped the researcher to obtain representative data which are not biased. A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample (Kothari, 2004).

3.4.1. Sampling Technique

Simple random sampling has been used because the researcher considers this to give a true picture of the results and hence not being biased. Also a fair representation from each party (Client, consultants and contractors) has been considered when sampling.

Sampling technique provides a range of methods that enable to reduce the amount of data needed to collect by considering only data from a sub group rather than all cases or elements. In a focus group, for example, you may want to consciously seek out respondents at both ends of a spectrum to insure that all viewpoints are adequately represented (Mark 2009).

3.4.2. Sample size

In this research study, the sample size was of 169 from a population of 291 using Slovin's formula. When it is not possible to study an entire population a smaller sample is taken using a random sampling technique. Slovin's formula allows a researcher to sample the population with a desired degree of accuracy. It gives the researcher an idea of how large his sample size needs to be to ensure a reasonable accuracy of results. (Michael Slovin 1960).

If a sample is taken from a population, a formula must be used to take into account confidence levels and margins of error. When taking statistical samples, sometimes a lot is known about a population, sometimes a little and sometimes nothing at all.

Slovin's formula is written as:

$n = N / (1 + Ne^2)$ While:

n = Number of samples N = Total population e = Error tolerance

To use the formula, first figure out what you want your error of tolerance to be. To this extent, the researcher was happy with a confidence level of 95 percent (giving a margin error of 0.05). This research has a group of 291 people as the project team of Multi-storey buildings project and we would need to survey them to find out which tools are best suited to this research. Here it is decided that we are happy with a margin of error of 0.05. Using Slovin's formula, it would be required to survey n = N / (1 + Ne^2) people:

291 / (1 + 291 (*0.05** 0.05) = 168,451 ⇔ 169.**

3.5.Data gathering instruments

3.5.1. Structured in-depth Interviews

Structured in depth interview has enabled the researcher to examine the level of understanding a respondent had about the topic. Since an interview is a purposeful discussion between two or more people. Interviews are meant to elicit primary data responses through direct questioning. All respondents are asked the same questions and it will be easy for the researcher to replicate the discussion or standardize.

It is the most common form of data collection in any construction survey such as elicits different people's opinions on a subject such as the impact of risk on a construction project. The advantages of using the interview technique approach are that the respondents can expand on areas of interest and can use non-verbal cues such as expression to emphasize their responses (Frankel, and Wallen, 1996)

3.5.2. Questionnaire

Questionnaires was elaborated and distributed to the target groups in order to obtain primary and reliable data from the respondents. Questionnaires are used to investigate attitudes, beliefs, feelings, opinions, knowledge and some aspects of behavior. Using questionnaires to collect data is a relatively quick way of gathering such information with relatively good response rates. It consists of open-ended and closed-questions.

The open-ended questions are advantageous because they give the respondents the opportunity to answer adequately applying the detail they like to qualify and clarify issues as well as giving them an opportunity for self-expression.

Objective responses have been obtained through closed questions while subjective responses were obtained through open-ended questions. The attempt by the instrument to combine some aspects of quantitative and qualitative data makes it an effective instrument (Sheila and Mwiria 1996).

3.5.3. Documentary review

This research had also reviewed literature obtained from the case study organization. This literature included RSSB annual reports and other reports from the project as well as other books about the subject matter. This method was chosen because; it is vital in providing background information and facts about risk management methods before primary data could be collected. Indeed, before Primary datais collected, a wide collection of data had been collected and this was used to cross check with the primary data that is to be obtained by the field.

3.6. Data Processing and analysis

The data collected were processed and analyzed. This involved data coding, editing and tabulation especially quantitative data. The purpose of all these is to make the information clear

and understandable for other people. Qualitative analysis techniques have been used. The Qualitative analysis techniques complemented with some statistics that were mainly obtained from the secondary data that was obtained through documentary analysis from the case study organization. Statistics obtained from the primary data is included also in this research.

3.6.1. Editing

Editing was done as a process of re-evaluation and correction of errors in fact judgment. It also involved correction of spellings, punctuation and capitalization.

3.6.2. Coding

Coding was done for grouping facts according to the themes and sub – themes of the study. This was necessary for easy interpretation and analysis of results.

3.6.3. Graphical presentation

Graphical presentations were used for presentation of data in form of frequency and percentages. The graphs indicate the number of occurrence of responses to particular questions statically. The researcher has used SPSS software to analyze data and the presentations are in tables and graphs. Graphical presentations give clear understanding and interpretations of the results.

3.7. Data collection procedure

In order to collect appropriate data for the study, different sources have been used. For the theoretical background, a literature study was conducted, using both scientific articles written by professionals in the field as well as books and reports in the area of project and risk management.

3.8.Validity and reliability

The research has pre-tested the instrument using a pilot sample taken from population under study. The experts including research supervisor were requested to judge the instruments with regard to the comprehensiveness of the questionnaire and interview guide to answer the research questions. The questionnaires and interview guide has been revised to incorporate these comments.

3.9. Ethical consideration

The study has certainly ensured that research ethics are not breached. All the information obtained from the respondents was handled with confidentiality and the names of respondents are not disclosed.

Secondary, all sources of information be it text books, journals, internet, magazines, dissertations were acknowledged. Similarly, all respondents were acknowledged for the information given.

Last but not least, all the data collected are managed without any manipulation to make the study come out in its own form.

CHAPTER 4

RESEARCH RESULTS AND DISCUSSION

4.1. Introduction

This chapter brings out the research results and discussions. Data is hereby presented in line with the methodology of the study described in chapter three above while the discussions are guided by the results of the study.

4.2. Demographic characteristics of respondents

4.2.1. Gender of respondents

The study considered both the male and female respondents. In RSSB multi-storey project, Males made up 85% while females made up 15%.

The figure 4.2.1 and Table 4.2.1 below show the percentage distribution of respondents by sex.

Table: 4.2.1. Gender of respondents

Frequency Distribution	Respondents	Percentages
Female	18	15%
Male	102	85%

Source: Primary data (2015)

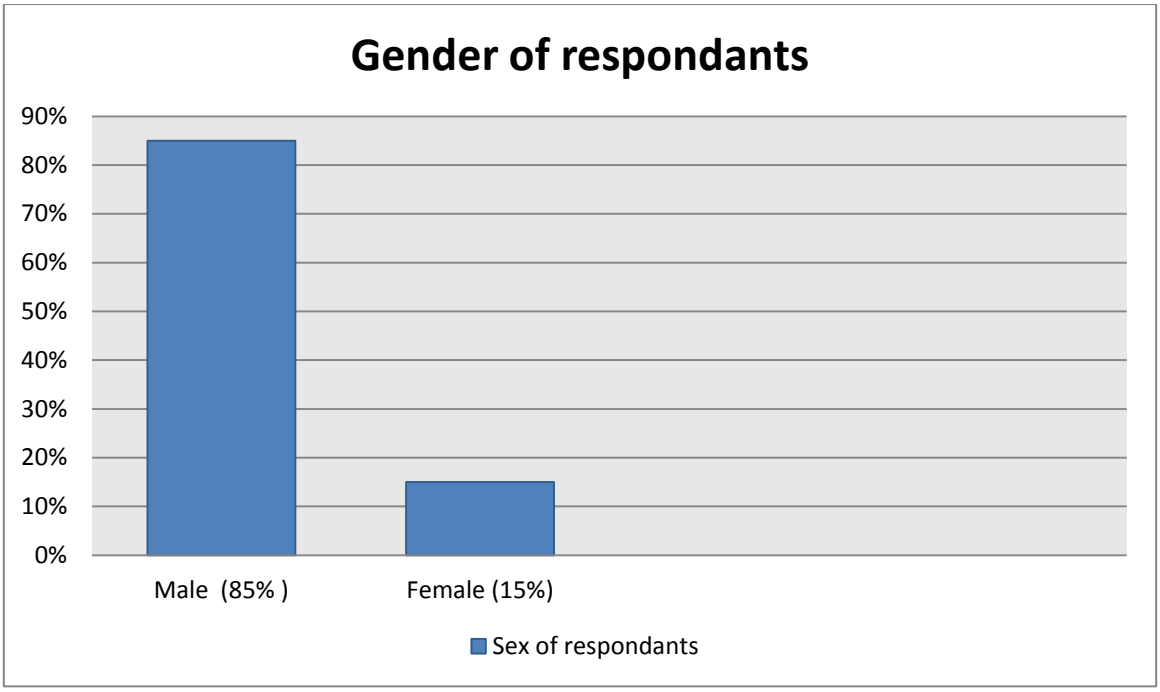

Figure: 4.2.1. Gender of respondents

4.2.2. Age group of respondents

In analysing the age of respondents within RSSB multi-storey construction project, the researcher categorised age in groups as follow: 21-30, 31-40, 41-50 and 51+. Findings revealed that there were no respondents aged between 51 and above. All respondents actually sampled and interviewed were mainly between 21 and 30, these were represented by 53%, and another category aged between 31 and 40 were represented by 22% while those aged 41-50 were represented by 25%. It also needs to be noted that there were no any respondents aged between 51 and above, this age group was therefore eliminated from the analysis. Table 4.1 and Figure 4.2 below show the age group of respondents.

Taking into account the fact that the respondents were multi-storey project team, one may argue that the construction industry requires more energetic category of people rather than adult ones. This is likely to be true as we did not find any one within this range of age among the project team.

Table 4.2.2: Response according to age group of respondents

Class	Frequency	Percentages
21 - 30	64	53%
31 - 40	26	22%
41 - 50	30	25%

Source: Primary data (2015)

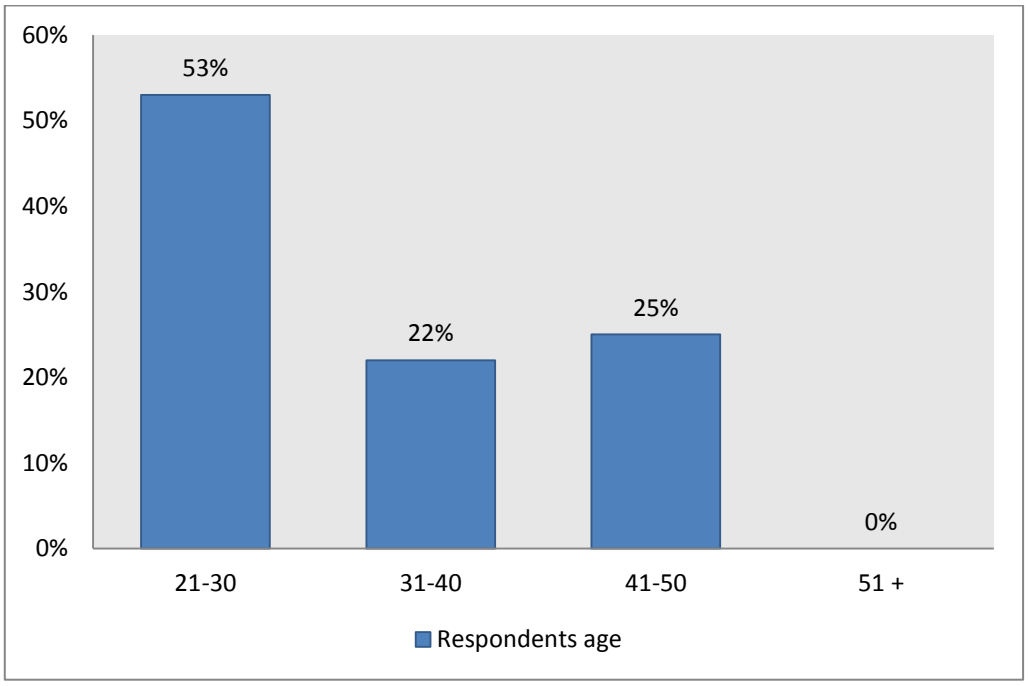

Figure: 4.2.2 Age of respondents

4.2.3. Level of education of respondents

The level of education of respondents is also analysed in RSSB multi-storey construction project. The researcher considered primary, secondary, university and post graduate levels of education as units of analysis.

Findings of the study show that majority of respondents were secondary school graduates (35%), followed by university graduates (33%). Post graduate covers 27% and 5% had primary level. Figure 4.2.3 and Table 4.2.3 below shows the percentage distribution by level of education of respondents.

It also seems clear that most multi-storey project team were secondary school graduates. This also clearly reflect that people aged 21 to 30 are actually in secondary school or university/collage in actual cases. This again conforms to the fact that RSSB in its multi-storey construction project interested in youth.

Table: 4.2.3 Education of respondents

Education Level	Frequency	Percentages
Primary	6	5%
Secondary	42	35%
University	40	33%
Post graduate	32	27%

Source: Primary data (2015)

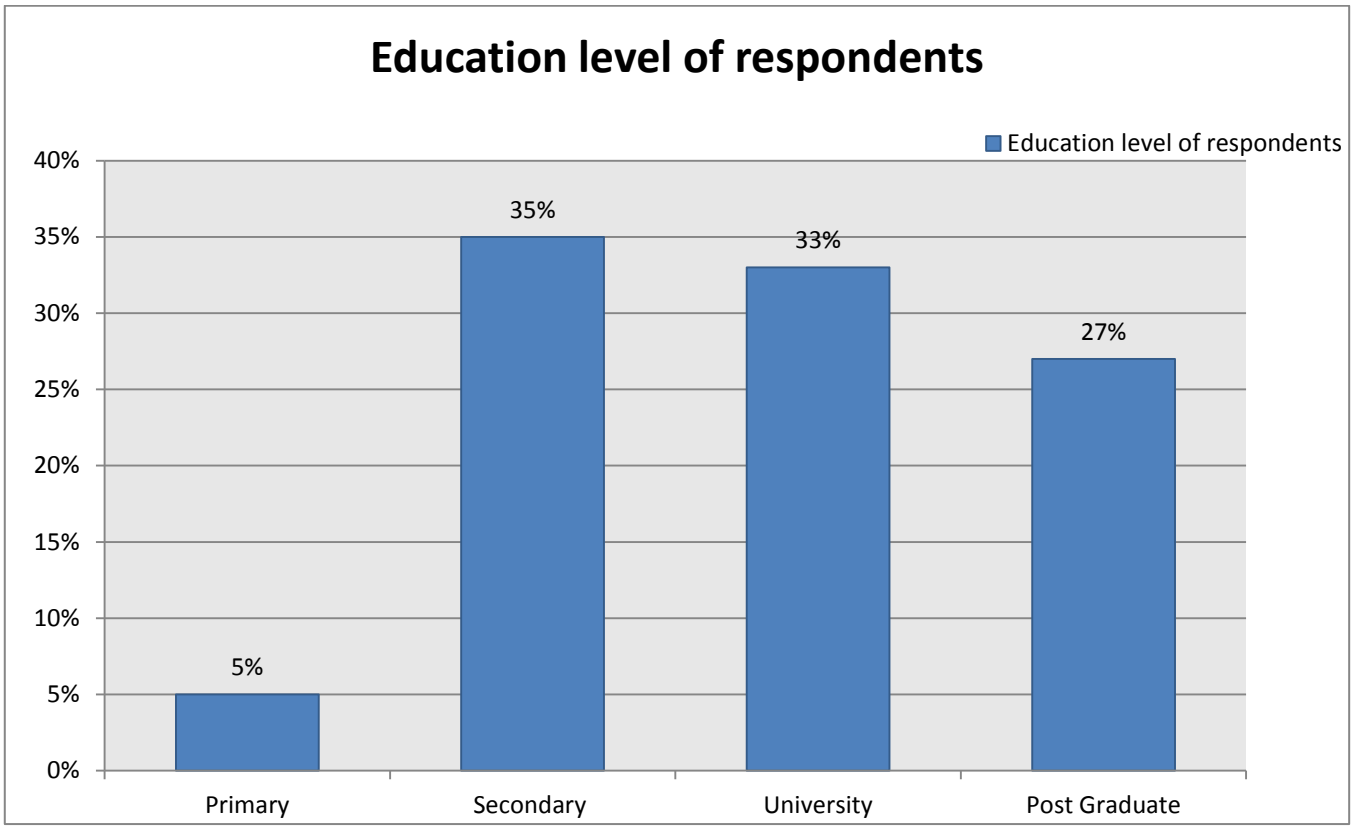

Figure 4.2.3: Education of respondents

4.2.4. Marital status of respondents

The researcher further analysed the marital status of respondents. The researcher categorised the potential statuses as single, married, divorced and widowed. Findings show that in RSSB multi-storey construction project there was no respondent that had been widowed and only 2% had been divorced. On the other hand 48% were married while 50% of the respondents were single.

Probably the rate of early marriage can be said to be low if findings of this study are to the generalised. Most respondents aged 31 to 40 were actually the ones that were married while those aged below 30 were mainly single.

Table: 4.2.4. Marital status of respondents

Marital status	**Frequency**	**Percentages**
Single	60	50%
Married	57	48%
Divorced	3	2%

Source: Primary data (2015)

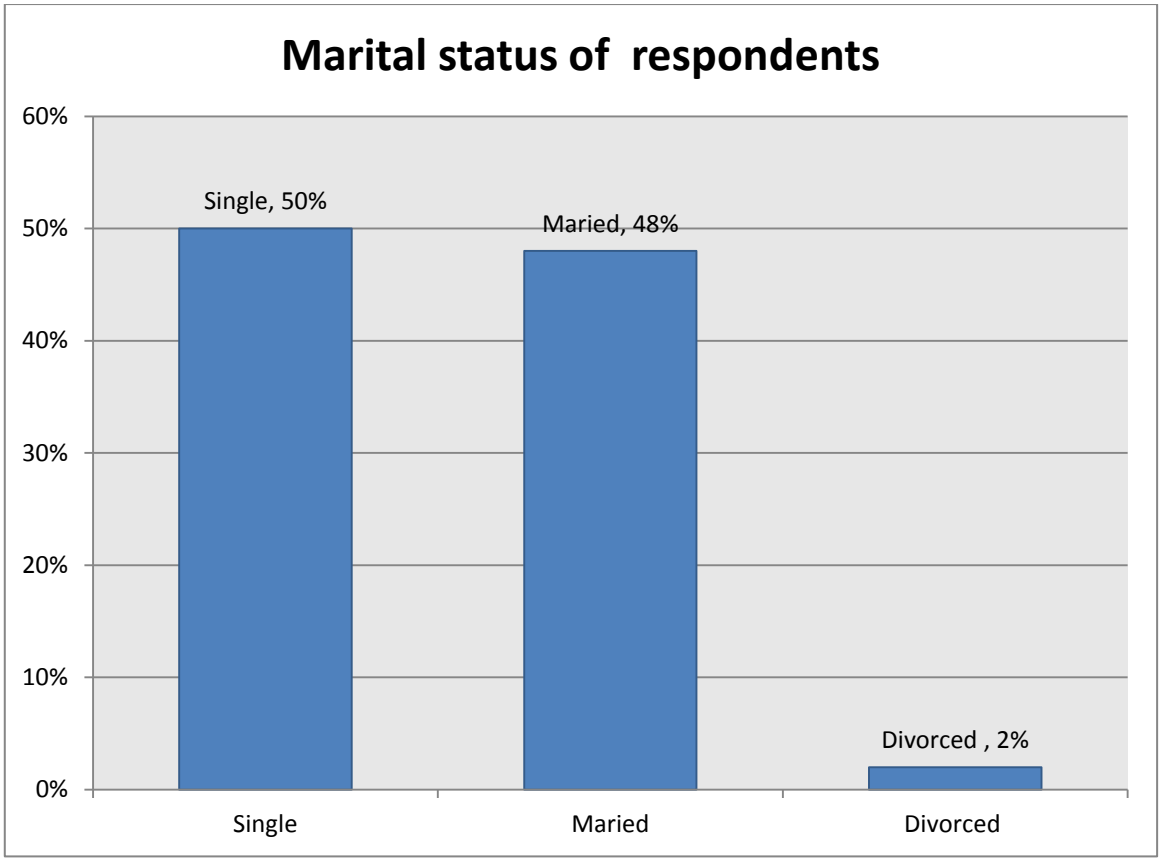

Figure: 4.2.4: Marital status of respondents

4.2.5. Organization of the respondents

Within the RSSB multi-storey construction project, respondents participating in the execution of the project, belong respectively in client budget officer representative 1%, client project manager 0.85%, client project finance manager 1%, client supervisor 1%, client site engineer 17.5%, client quality engineer 2%, client electrical engineer 2%, client structural engineer 2%, client architectural engineer 0.85%, contractor representatives 15%, contractor site engineers 32%, contractor site manager 0.85%, consultant 15%, contractor estimator 5% and design manager 3%.

Table: 4.2.5 Responses on organization of respondents

Organization of respondents	Frequency	Percentages
client	34	28.2%
Contractor	62	52.85%
Estimator	2	1%
Consultant	18	15%
Design manager	4	3%

Source: Primary data (2015)

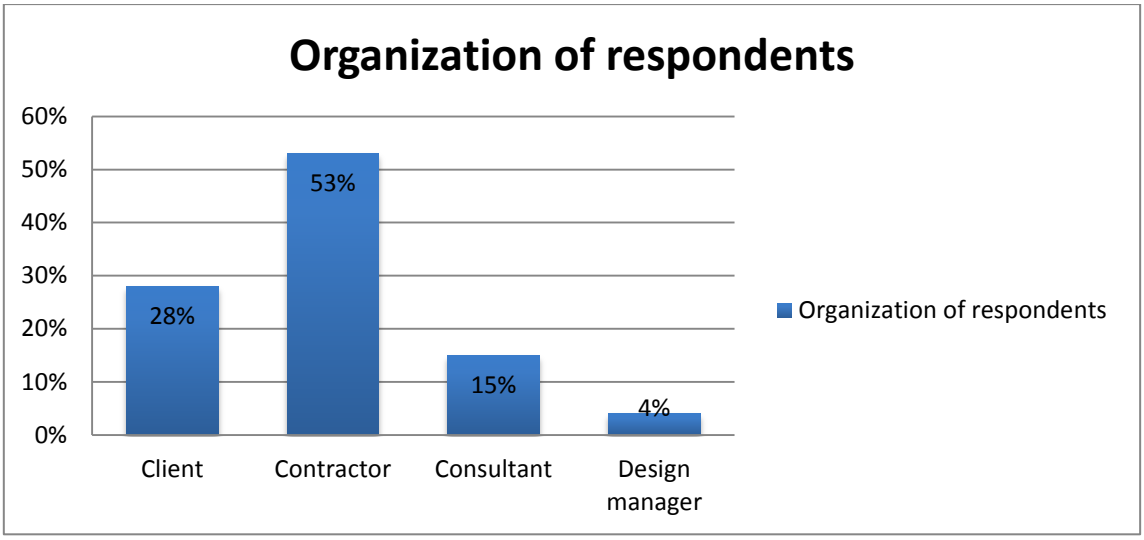

Figure: 4.2.5 Organization of respondents

4.2.6. Experience within construction industry

The relevancy of gathered data depends also on the experience one have in the construction industry. The ranges fall within 0-5 years, 6-10, 10-15 and 15-above as per below table.

Table: 4.2.6 Responses on experience of respondents

Experience (years)	**Frequency**	**Percentages**
0-5	28	23%
6-10	52	44%
10-15	19	16%
15-above	21	17%

Source: Primary data (2015)

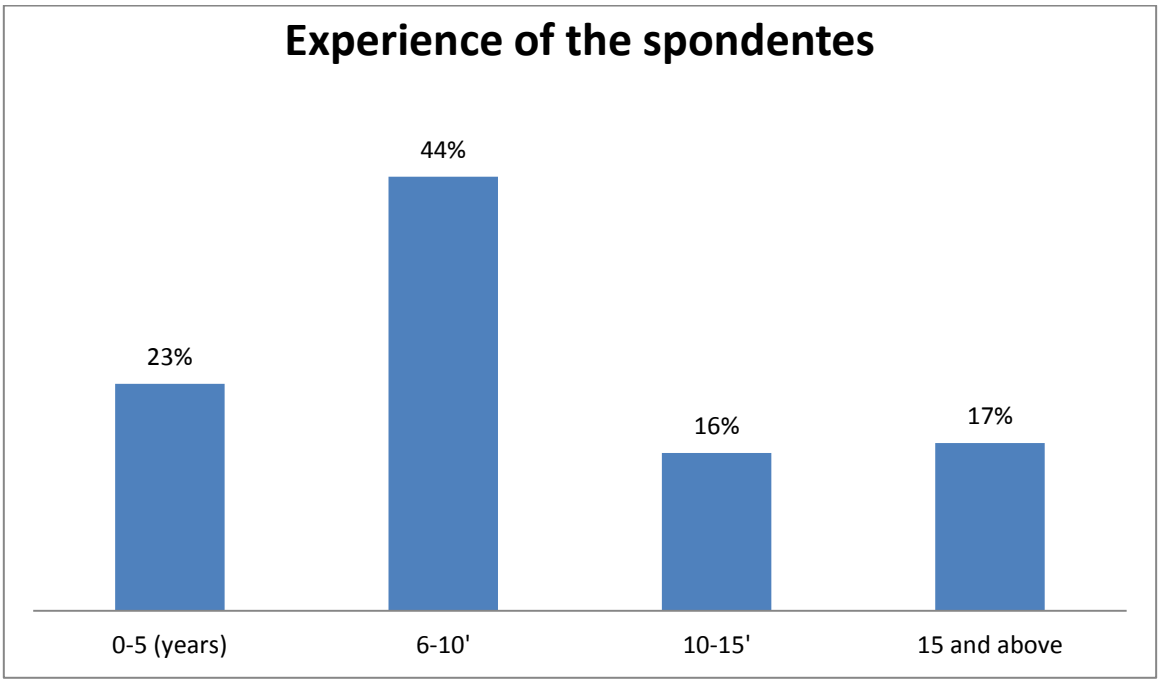

Figure: 4.2.6 Experience of respondents

4.2.7. Knowledge of risk management methods

In RSSB multi-storey construction project, the researcher also inquired on whether the respondents have knowledge on risk management. Project team were asked whether they have studied risk management or have knowledge about risk management methods. Findings revealed that 18% of the respondents rates very bad their knowledge on risk management , 36% Fairly bad, 51% were fairly good while only 12 % very good. This means that clearly most of respondents have just basic professional knowledge of risk management.

Table: 4.2.7 Responses on knowledge of risk management

Knowledge of risk management	Frequency	Percentages
Very bad	18	15%
Fairly bad	36	30%
Fairly good	51	42%
Very good	15	12%

Source: Primary data (2015)

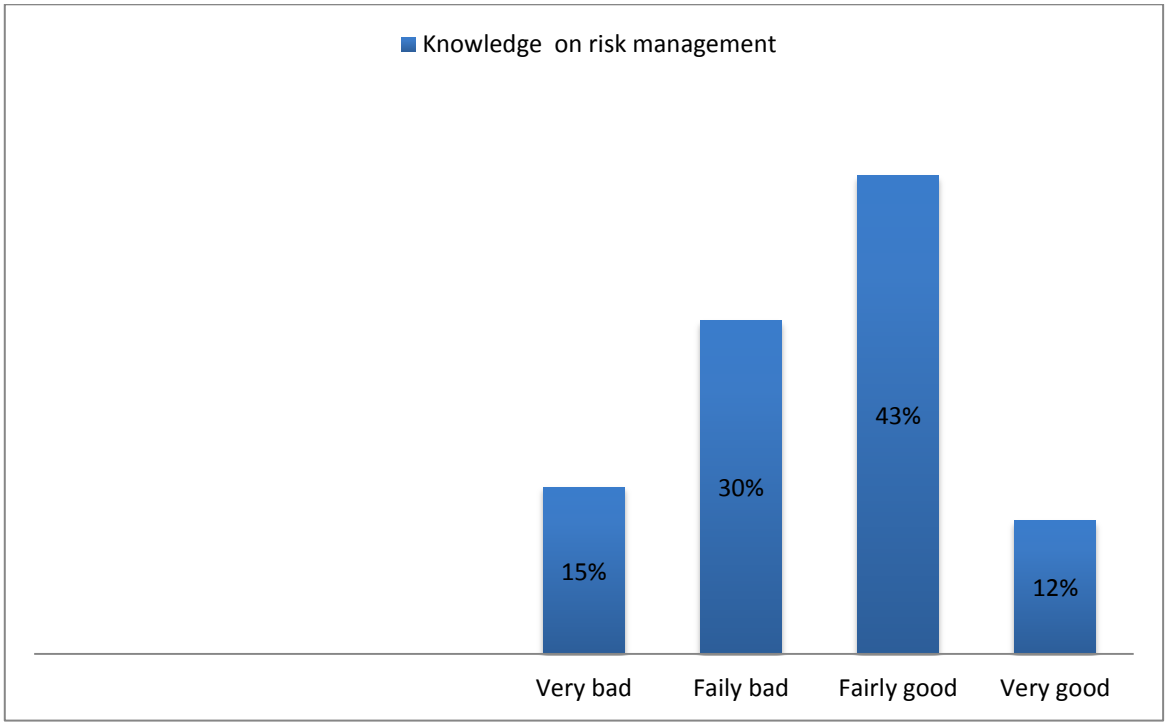

Figure: 4.2.7 Knowledge of risk management methods

4.3. Presentation of findings

The study analyzed and discussed about the points related to the objective of the study. It is notably, the Effects of risk avoidance/prevention on project performance, the effects of risk retention on project performance; influence of risk control (loss control) in multi-storey construction project; influence of risk transfer in Rwandan construction industry; relationship between project performance and risk management methods.

4.3.1. Areas of multi-storey construction project in which risk avoidance /prevention influenced performance

A construction project (as any project) is divided into four main phases: Initiation phase, Planning Phase, Execution Phase and Closure phase. This section was designed to explore the aspects of the risk avoidance or prevention through the different phases of RSSB multi-storey construction project. Risk avoidance usually involves developing an alternative strategy that has a higher probability of success but usually it may incur higher cost associated with accomplishing a project task. A common risk avoidance technique is to use proven and existing technologies rather than adopt new techniques, even though the new techniques may show promise of better performance or lower costs. This approach may be used to either ensure quality, to ensure customer satisfaction, to manage resources or to ensure with project plan.

The aim of risk avoidance method is to maximize opportunities and minimize consequences of a risk event. To this extent respondents were asked to specify which area does risk avoidance influence their performance.

Findings proved that 29% risk avoidance helped them to ensure quality; 19% risk avoidance helped them to ensure customer satisfaction, 41% risk avoidance helped them to manage resources and 11% risk avoidance helped them to ensure with project plan.

Table: 4.3.1 Responses on Areas of multi-storey construction project in which risk avoidance /prevention influenced performance

Risk avoidance and project performance	Frequency	Percentages
Ensure quality	35	29%
Ensure customer satisfaction	22	19%
Manage resources	50	41%
Ensure with project plan	13	11%

Source: Primary data (2015)

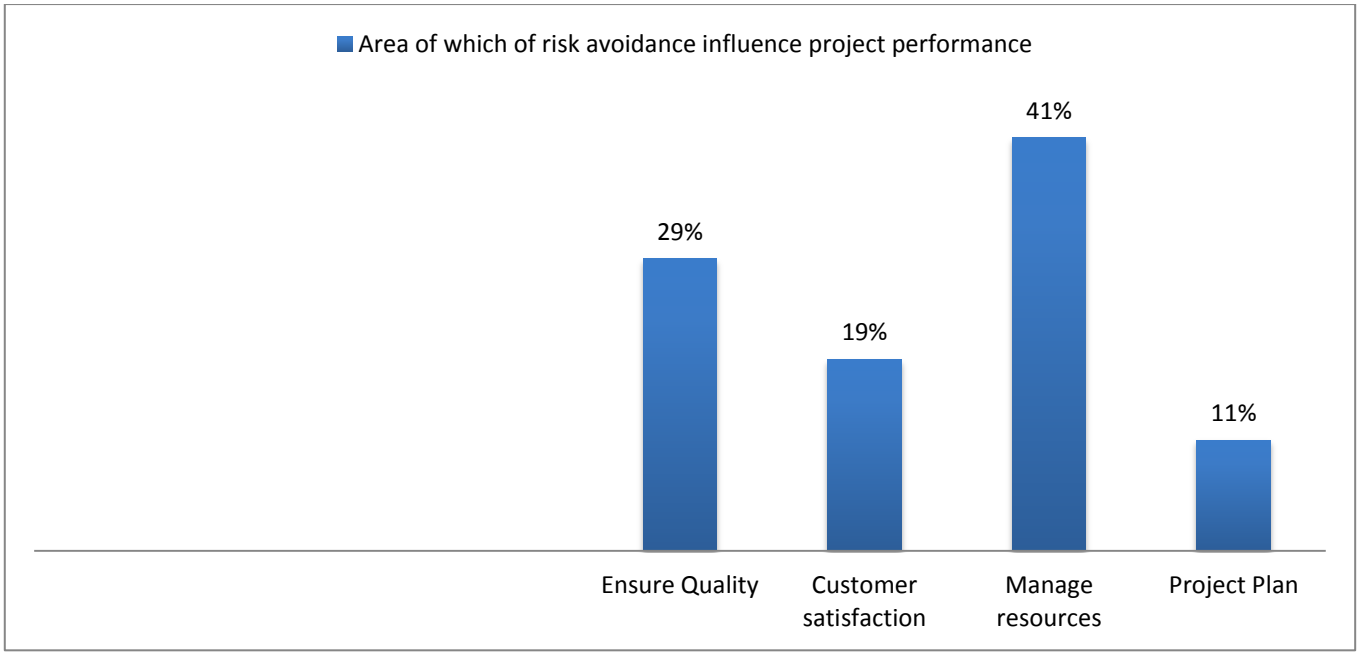

Figure: 4.3.1 Area of which of risk avoidance influence project performance

4.3.2. Application of risk avoidance method in multi storeyed construction project

The researcher also sought to find out how frequent project team applied risk avoidance method in RSSB multi storey construction project towards performance. Findings from the study show that; 47% applied this approach weekly, 42% monthly, 8% quarterly and 3% rated rarely. Generally risk avoidance is much known and being applied.

Table: 4.3.2 Responses on Application of risk avoidance method in multi storeyed construction project

Application of risk avoidance	Frequency	Percentages
Rarely	4	3%
Quarterly	10	8%
Monthly	50	42%
Weekly	56	47%

Source: Primary data (2015)

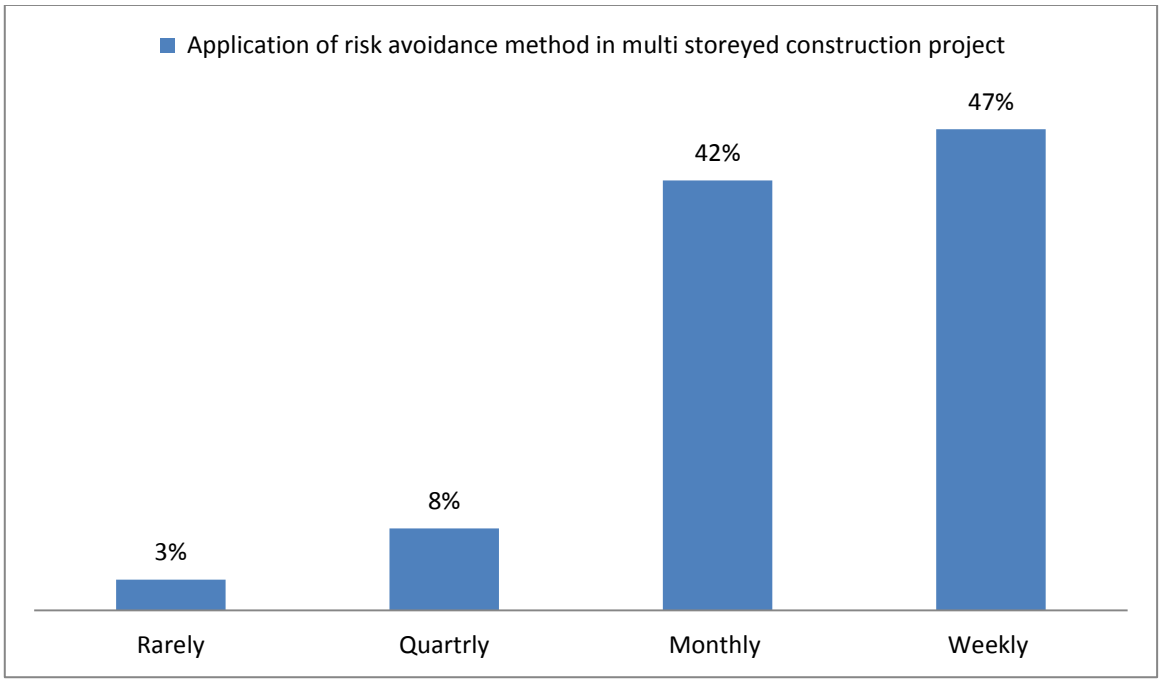

Figure: 4.3.2. Application of risk avoidance method in multi storeyed construction project

4.3.3. Risk avoidance as an appropriate method for RSSB multi-storey project

During the research we came across to notice that in RSSB multi-storey construction project the method of avoiding risks has been considered and articulated in the project appraisal. It is therefore very necessary to consider the risks arising affect the performance of the project for three main reasons:

- If a project is to be delivered in line with a plan then consideration needs to be given to those issues that may throw the plan off course. These issues (risks) need to be addressed in the most appropriate way;
- The authorizers of projects need to have confidence that the key deliverables can be delivered on time, and to budget, with an acceptable level of risk;
- If the performance of a project would be materially affected by an event it will be advantageous to the Project Manager to have previously identified and explained this risk to the authorizers of the project.

Thus respondents were asked how why did they chose this method as an appropriate for their project. Their views and findings to the approach were very pertinent and hence rated as follow:

3% previous experience, 12% nature of work, 44% clients' wish and 41% appraised that it was project manager's decision, as per below table and figure.

Table: 4.3.3 Responses on risk avoidance as appropriate method for RSSB multi-storey project

Risk avoidance and performance	Frequency	Percentages
Previous experience	4	3%
Nature of work	14	12%
Client's wish	53	44%
Project manager's decision	49	41%

Source: Primary data (2015)

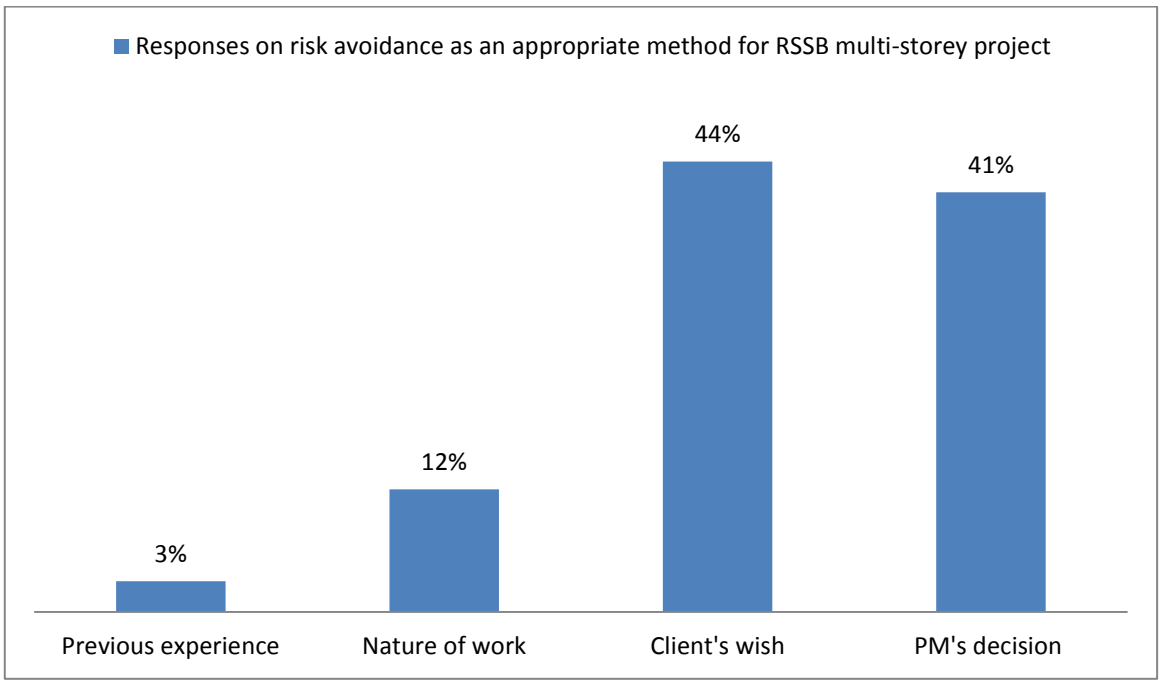

Figure 4.3.3 Responses on risk avoidance as an appropriate method for RSSB multi-storey project.

4.3.4. Responsibilities of avoiding/ preventing risk

Risk is inherent and unavoidable in any industry. The construction industry, with its often complex web of interdependent and carefully sequenced workflows, is certainly no exception. Of course, every case is different and there is unfortunately no one-size-fits-all. There are, however, certain risk areas commonly arising in the construction industry and which can often be easily and inexpensively avoided with the benefit of proper and timely legal advice. The research analyzed three parties of RSSB multi-storey construction project, which is client (RSSB) Consultant, or supervisor and main contractors.

To this extent contractors are often risk being held liable for defects or delays in parts of the works which they do not directly control. To avoid such risks they should:

- Negotiate and take advice about suitable extension of time, liquidated damages and defect liability clauses to protect their self against liability for delays or defects which are beyond their control;
- If you are a head contractor under a design-and-construct contract, keep yourself out of the frame for design faults by ensuring that your subcontracts allow you to pass that liability down to responsible design consultants and specialists;
- Exclude, limit and cap liability, being clear about the precise scope of exclusions and limitations and the precise circumstances in which liability will be capped.

Findings and respondents rated that contractor suffers up to 48%, client 20%, consultant 30% and subcontractors are rarely 2% as per below table and figure 4.3.4

Table: 4.3.4. Responsibilities of avoiding/ preventing risk

Responsibilities of avoiding risk	Frequency	Percentages
Client	24	20%
Consultant	36	30%
Contractor	58	48%
Other	2	2%

Source: Primary data (2015)

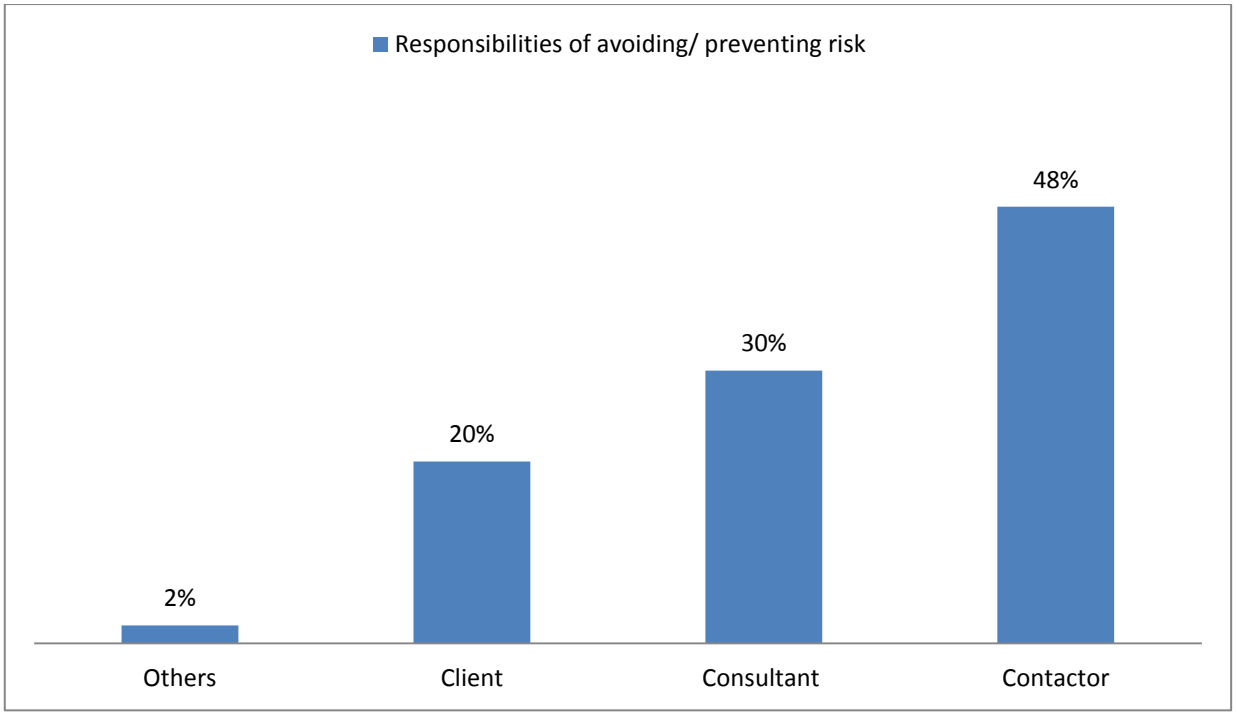

Figure: 4.3.4. Responsibilities of avoiding/ preventing risk

4.4. Assessment on influence of risk control loss control to the project performance

Most of the construction projects are having their own risks and loss factors involved, and hence in order to control such damages, they have to use strategies to control those risk and loss factors related to project.

For construction projects, there are many risk and loss facets as well as complicated relations, which will influence it. The complicated relations include direct, indirect, obvious, implicit or unpredictable. What's more, the various risk factors will cause different severity of the consequences. If you do not consider these risk factors, or ignore the major factors, they all will cause damage because of decision-making errors. Quality targets, time targets, cost targets are the three objectives of project management. In the construction project, the time objective is closely and inseparably related to the cost objective. Hence risk and loss management of construction period is a key part in the risk management of construction.

In this, three points were developed to sightsee more about risk control and its influence on project performance basing on RSSB multi- storey construction project.

4.4.1. Criteria considered as measures of risk control vis-à-vis to project performance

Risk control/ loss control involves partnering with others to control the influence of risk or loss to the project. According to field data result, RSSB's Multi-storey project has reduced political, legal, labor, and other risks types by developing a joint venture with the main contractors whom participated in the execution of the project and they were all located in Rwanda. Partnering with another company to share the risk associated with a portion of the project was advantageous as the other companies had expertise and experience the project team does not have. If the risk event does occur, then the partnering company absorbs some or all of the negative impact of the event. The company will also derive some of the profit or benefit gained by a successful project.

To this point, respondents were asked within the four criteria (project cost, project completion time, client satisfaction and quality of the project) which criteria they consider as measures of risk control vis-à-vis to the performance of the project. Their views and findings to the approach were positive hence rated 23% for project cost, 22% valued project completion time, 24% appraised client satisfaction and 31% admired quality of the project, as per below table and figure.

Table: 4.4.1 Criteria considered as measures of risk control vis-à-vis to project performance

Criteria considered as measures of risk control	Frequency	Percentages
Project cost	28	23%
Project completion time	26	22%
Client satisfaction	29	24%
Quality of the project	37	31%

Source: Primary data (2015)

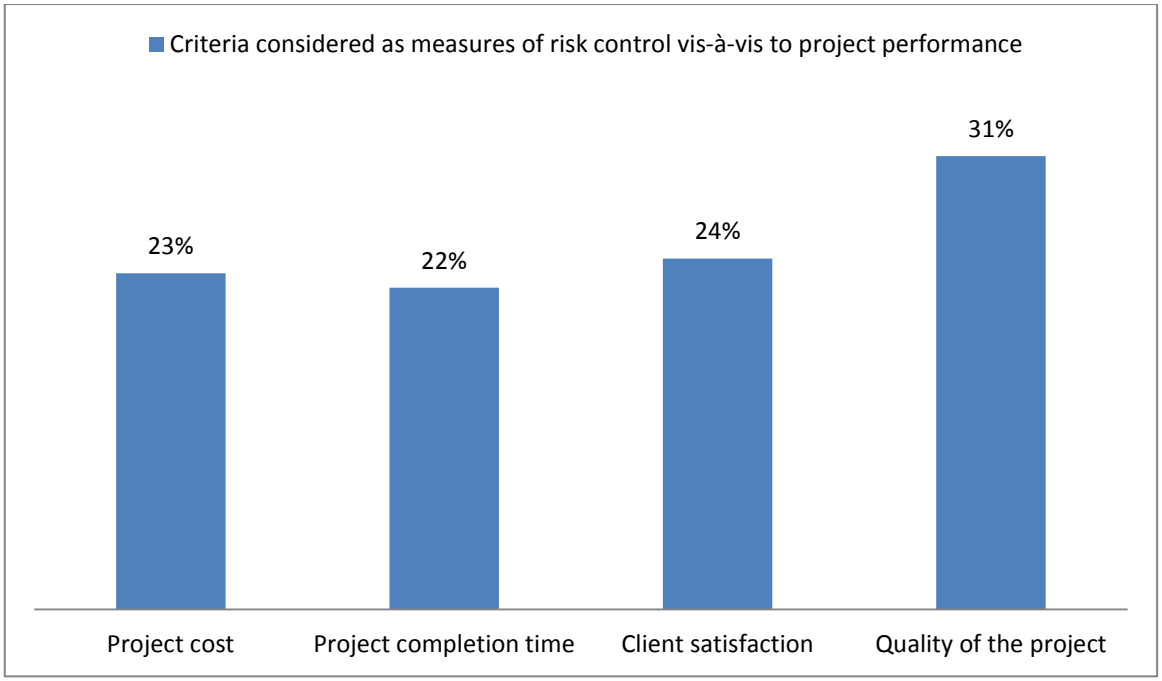

Figure: 4.4.1 Criteria considered as measures of risk control vis-à-vis to project performance

4.4.2. Parameter in percentage of risk control on project performance

Risk control is the process of keeping track of the identified risks, control residual risks and identifying new risks, ensuring the execution of risk plans, and evaluating their effectiveness in reducing risk. Risk control records risk metrics that are associated with implementing contingency plans. Risk control is an ongoing process for the life of the project. The risks change as the project matures, new risks develop, or anticipated risks disappear. Good risk control processes provide information that assists with making effective decisions in advance of the risk´s occurring. Communication to all project stakeholders is needed to assess periodically the acceptability of the level of risk on the project. The purpose of risk control is to determine if:

- Risk responses have been implemented as planned.
- Risk response actions are as effective as expected, or if new responses should be developed.
- Project assumptions are still valid.
- Risk expose has changed from its prior state, with analysis of trends.

- A risk trigger has occurred.
- Proper policies and procedures are followed.
- Risks have occurred or arisen that were not previously identified.

Risk control may involve choosing alternative strategies, implementing a contingency plan, taking corrective action, or re-planning the project. The risk response owner should report periodically to the project manager and the risk team leader on the effectiveness of the plan, any unanticipated effects, and any mid-course correction needed to mitigate the risk.

Thus risk control regulates project performance. In RSSB Multi-storey construction project, the respondent's views on risk control parameter in percentage of risk control on project performance, most of them assumed that risk control has a huge influence on project performance. Results are presented in the below table and figure 4.4.2 as follows:

Table: 4.4.2. Responses on risk control parameter in percentage for risk control on project performance

Risk control parameters in percentage	Frequency	Percentages
10-30%	4	3%
30-50%	14	12%
50-70%	49	41%
70 and above	53	44%

Source: Primary data (2015)

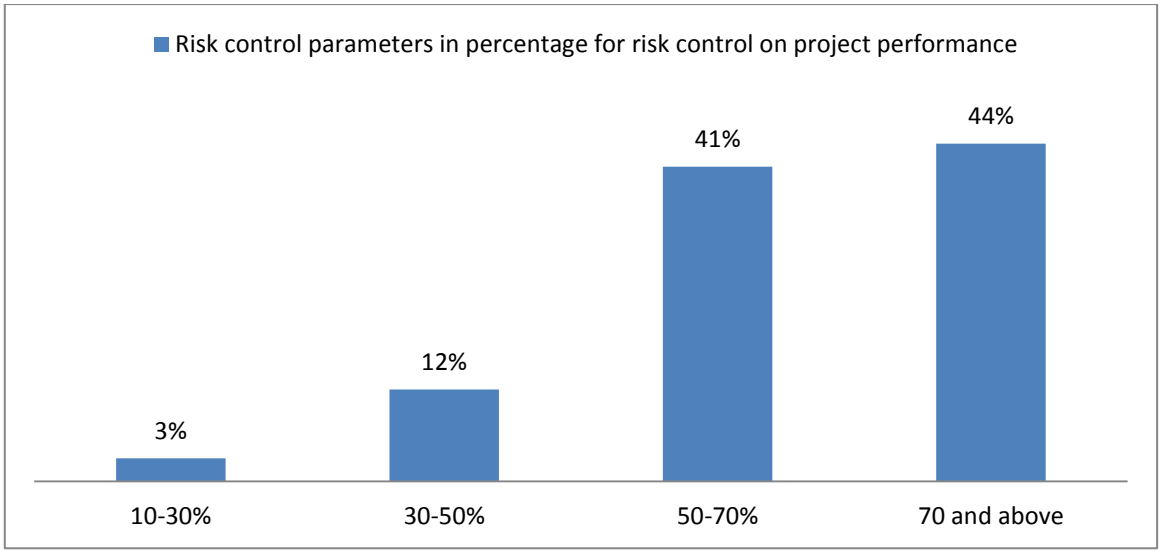

Figure: 4.4.2. Risk control parameters in percentage for risk control on project performance.

4.4.3. Influence of risk control on project performance

Risk control involves executing the Risk Management Plan in order to respond to risk events over the course of the project. When changes occur that include risks, the cycle listed below may be followed:

- Identify the actual risk event - some of the identified risk events will occur; others will not occur.
- Qualify/quantify -as risks are qualified and quantified, the project management team must separate actual risk events from sources of risk.
- Respond - the response for the risk should be appropriate for the risk as defined in the Risk Management Plan.

It is important to understand that even the most thorough and comprehensive analysis cannot identify all risks and probabilities correctly; identification of risks are necessary for the performance of the project. Some effective tools and techniques for risk control are Workarounds. Workarounds are unexplained responses to negative risk events and are considered to be short-term solutions. Workarounds are unplanned in the sense that the response was not defined in advance of the risk event occurring. If the risk event was not anticipated or

the effect was greater than expected, the planned response may not be adequate. When this happens, it will be necessary to repeat the response process and the risk quantification process.

Consequently risk control influences hugely project performance. In RSSB Multi-storey construction project, the respondents were asked if the admit with this fact and have their own comment. Most of them assumed that risk control has a huge influence on project performance. Results are presented in the below table and figure 4.4.3 as follows:

Table: 4.4.3. Responses on influence of risk control on project performance

Influence of risk control on project performance	**Frequency**	**Percentages**
Strongly disagree	2	2%
Disagree	10	8%
Agree	48	40%
Strongly agree	60	50%

Source: Primary data (2015)

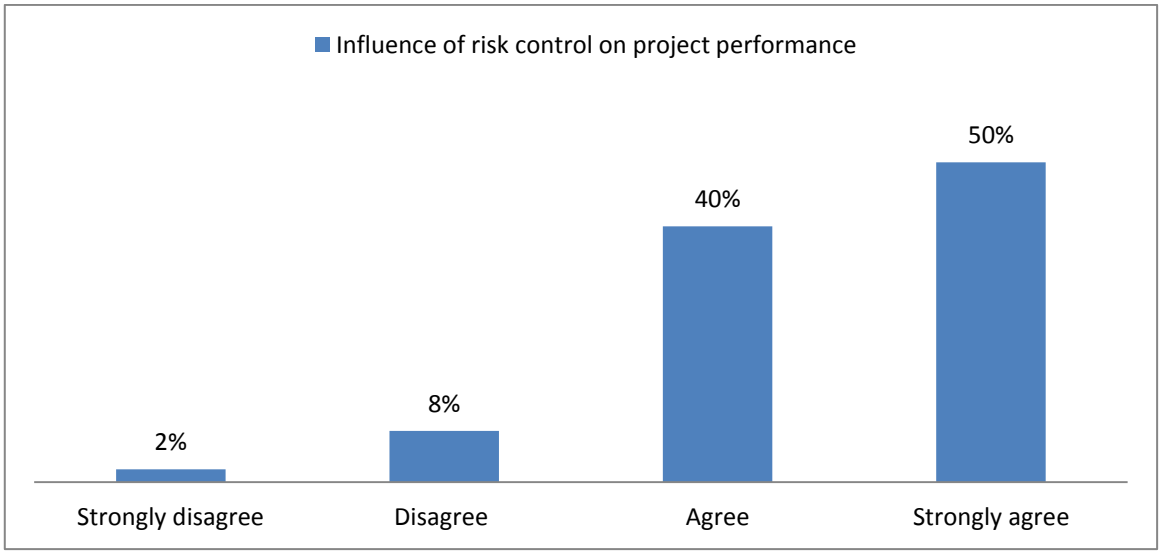

Figure: 4.4.3 Influence of risk control on project performance

4.5. Evaluation of risk retention on project performance

For mid-size and large companies, risk retention is generally more cost effective than purchasing insurance over the long run. This is because of the many frictional costs involved with buying insurance, such as loss of investment income on premiums paid, agent's commissions, insurer profits, premium taxes, and what not. However, the volatility of losses from one year to the next makes it somewhat more difficult to predict ultimate costs, making it prudent to use a blend of risk retention and risk transfer techniques.

Using this approach, insurance essentially becomes a smoothing mechanism. In some years, the insured will suffer few or no losses, and therefore collect less than it paid for the coverage, while in other years it will suffer large losses and collect much more than it paid. The insurer uses the premiums of those who do not suffer losses to pay the losses of those who do. If the insurer's prediction of the losses of the group of insured is grossly understated, it may incur an underwriting loss. The insurer considers this risk along with its overhead costs when determining the rates to charge for insurance. This explains why prudent risk retention can be more cost-effective than insurance. The contractor avoids the part of insurance premiums that go toward insurers' overhead and profit. Generally speaking, it is best to use risk retention for the working layers of losses. The working layer is the level of losses that occurs with sufficient frequency to obtain some degree of predictability. Insurance is then purchased for the more catastrophic higher loss levels.

4.5.1. Challenges associated with lack of risk retention method in RSSB multi-storey building

A lack of risk retention method in any construction project is one of the most visible deficiencies in risk management. Common risk management methods are that risks were dealt with as they appeared. Even the representative of a main contractor said that risk retention measures should be developed and they need to be fairly simple so that subcontractors are willing and able to perform. To main contractors, lack of this causes huge risks, and they had to accept responsibility for almost all the risks, since other actors were not necessary identifying risks, which is of course a risk to these subcontractors too.

To this point, respondents were asked the challenges which may have been caused by lack of risk retention method within RSSB multi-storey construction project. Their views and findings

to the approach were focused on project delay, excessive cost, client-contractor conflict and bad quality as the outcome of lack of these measures. This was notably revealed in NYANZA Pension Plaza building, where the approach had not been taken into consideration; and respondents hence 12% rated that lack of this method caused them the challenges on project delay, 24% excessive cost, 29% client-contractor conflict and 35% rated that it causes bad quality, as per below table and figure 4.5.1

Table: 4.5.1 Responses on Challenges associated with lack of risk retention method in RSSB multi-storey building

Challenges associated with lack of risk retention	Frequency	Percentages
Project delay	14	12%
Excessive cost,	29	24%
Client-contractor conflict	35	29%
Bad quality	42	35%

Source: Primary data (2015)

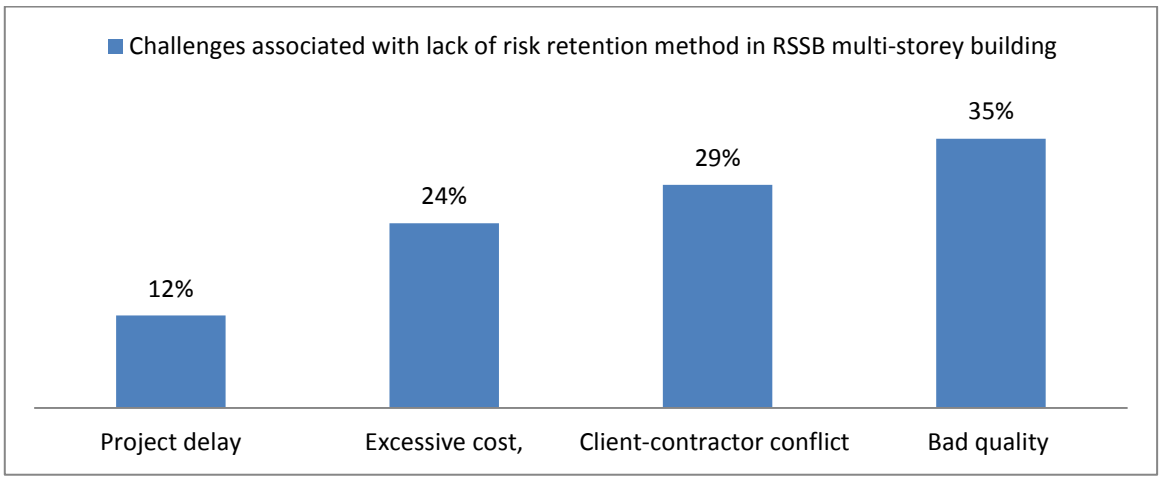

Figure: 4.5.1 Challenges associated with lack of risk retention method in RSSB multi-storey building

4.5.2. Impact of risk retention on project performance

Going to risk transfer we noticed that risk retention method is the one that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk transfer method. The risk is transferred from the project to the insurance company. Multi-storey project in RSSB has purchased storm and other natural hazards insurance that would cover the cost of a hurricane damaging the construction sites. The purchase of insurance was usually in areas outside the control of the project team. Weather, political unrest, and labor strikes are examples of events that can significantly impact the project and that are outside the control of the project team.

To this point, respondents were asked how they found the usage of this approach directed the performance of the project. Their views and findings to the approach were positive and hence 3% have strongly disagree with the impact, 12% disagree, 44% agree and 41% appraised the approach as very good, as per below table and figure 4.5.2.

Table: 4.5.2. Responses on relationship between risk retention and project performance

Risk retention and project performance	Frequency	Percentages
Strongly disagree	4	3%
Disagree	14	12%
Agree	53	44%
Strongly agree	49	41%

Source: Primary data (2015)

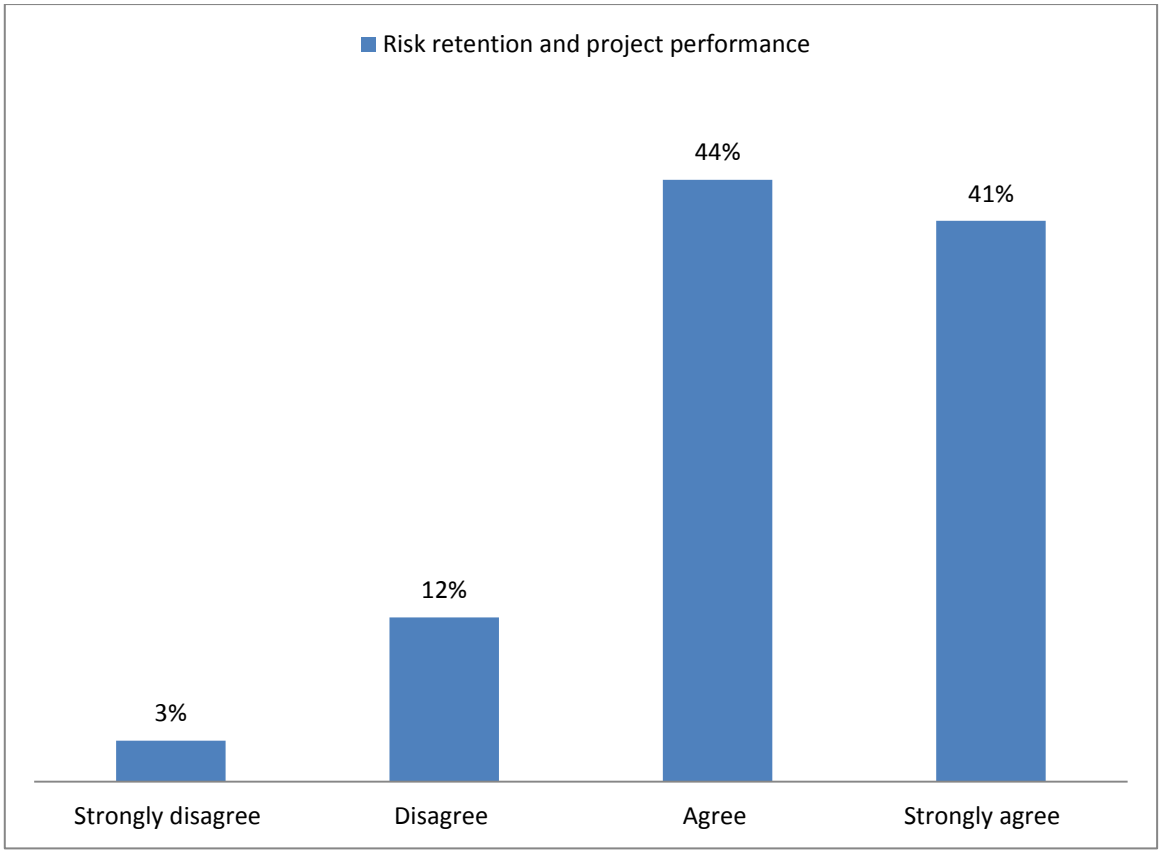

Figure: 4.5.2. Risk retention and project performance

4.5.3. Impact of risk retention on project performance in percentage

Risk retention is the level of risk an organization is willing to accept in order to achieve its business goals or objectives. Every individual and every organization has a different level of risk tolerance (often called its risk appetite), with corporate culture and values being a primary driver behind acceptable tolerance levels.

Risk retention then is the result of making a deliberate decision to endure the consequences of an event should it occur. Tolerance of the risk can take one of two forms, passive and active.

Passive acceptance occurs when no action is taken to resolve the risk, cope with it, or otherwise manage it.

With active acceptance, action is taken to manage the impact of the event should the event occur. In these circumstances, contingency or fallback plans are followed only when the event occurs.

Risk retention is the lowest form of control, in as much as it is typically only a good choice when all other strategies are not viable. As such we either live with the risk and its loss consequences or we use the only available protection we can as a barrier or final line of defense.

Hence, risk retention is finally a matter of choice for the organization, but such choices should always be made wisely and based on the circumstances faced at a given time.

To this point, respondents were asked to indicate the percentage of which risk retention affected their performance to RSSB multi-storey project. Their views and findings to the approach were as follow: 11% have rated that it has an impact between 10-30%; 21% rated 30-50%; 37 rated 50-70 and the remaining 31% of respondents rated above 70% as per below table and figure 4.5.3.

Table 4.5.3 Respondent's views on percentage of which risk retention affects project performance

Percentage of which risk retention affects project performance	Frequency	Percentages
10-30%	13	11%
30-50%	25	21%
50-70%	44	37%
70 and above	38	31%

Source: Primary data (2015)

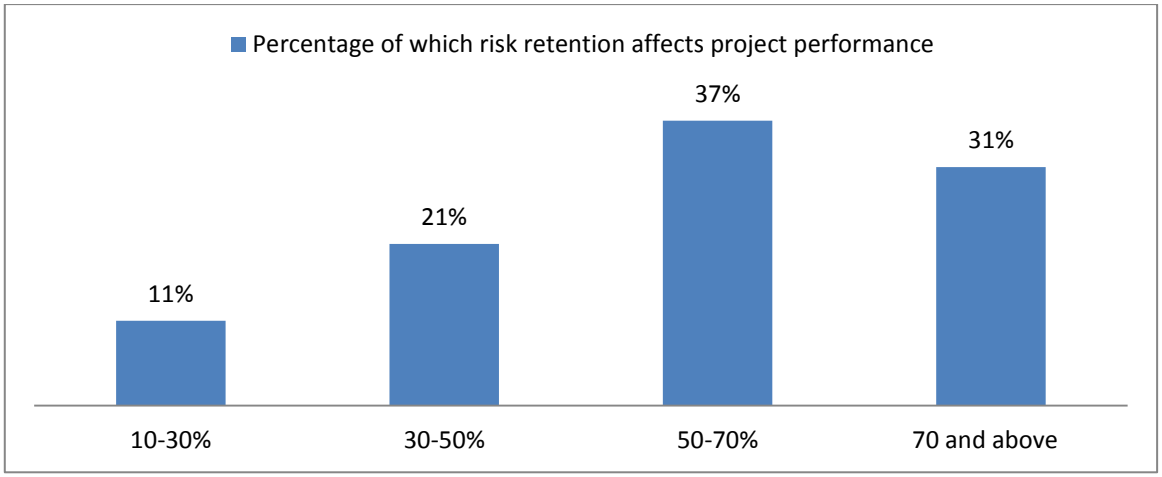

Figure: 4.5.3 Percentage of which risk retention affects project performance

4.5.4. Other factors affecting project performance vis-à-vis to risk retention

Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety. Generally, performance dimensions may have one or more indicators, and could be influenced by various project characteristics. And many researchers states other factors as having an influence on project cost performance, these include: project manager's competence, top management support, project manager's coordinating and leadership skills, monitoring and feedback by the participants, decision-making, coordination among project participants, owners' competence, social condition, economic condition, and climatic condition.

However throughout this research we opt to retain the most significant of all the factors, having maximum influence on project performance. Which are project time p, cost, quality and schedules; the identification of these factors and the measurement of their severity would provide useful information that would greatly reduce cost and time overrun in project execution and therefore became imperative to assess the impact of these variables on project performances.

Within risk retention approach, there are several factors that contribute to project performance in construction industry. According to the views of the respondents, we can draw conclusion on the same. As per the figure 4.5.4, cost came as the top with 42.3% of the respondents. They considered cost as a main factor contributing to the project performance. Before undertaking any project, there must be a well-designed project cost that meets schedules such as Gantt charts to plan and subsequently report progress within the project environment.

For construction projects, there must be well planned budget and if not, the project performance is questionable. Furthermore, other respondents making 23% of the sample size said that mostly quality matters also. The project may require huge resources and enough skills and if the present worker fails to deal with that specific challenge, leads to poor project performance. On the other hand, 19% of respondents agreed that time is another critical factor that contributes to project performance. They argued that some contractors win tender in inadequate manner where they are not even able to deliver what is intended due on time to various factors such as experience, materials, workers skills and expertise. These definitely cause the problems at the end of the project as the deliverables do not meet the standards. The remaining number of 16% confirmed

that schedules have power over the project performance. Below table and figure 4.5.4 show the respondent's perception.

Table: 4.5.4. Respondent's perception on other factors affecting project performance vis-à-vis to risk retention.

Other factors affecting project performance	Frequency	Percentages
Time	23	19%
Cost	50	42%
Quality	28	23%
Schedules	19	16%

Source: Primary data (2015)

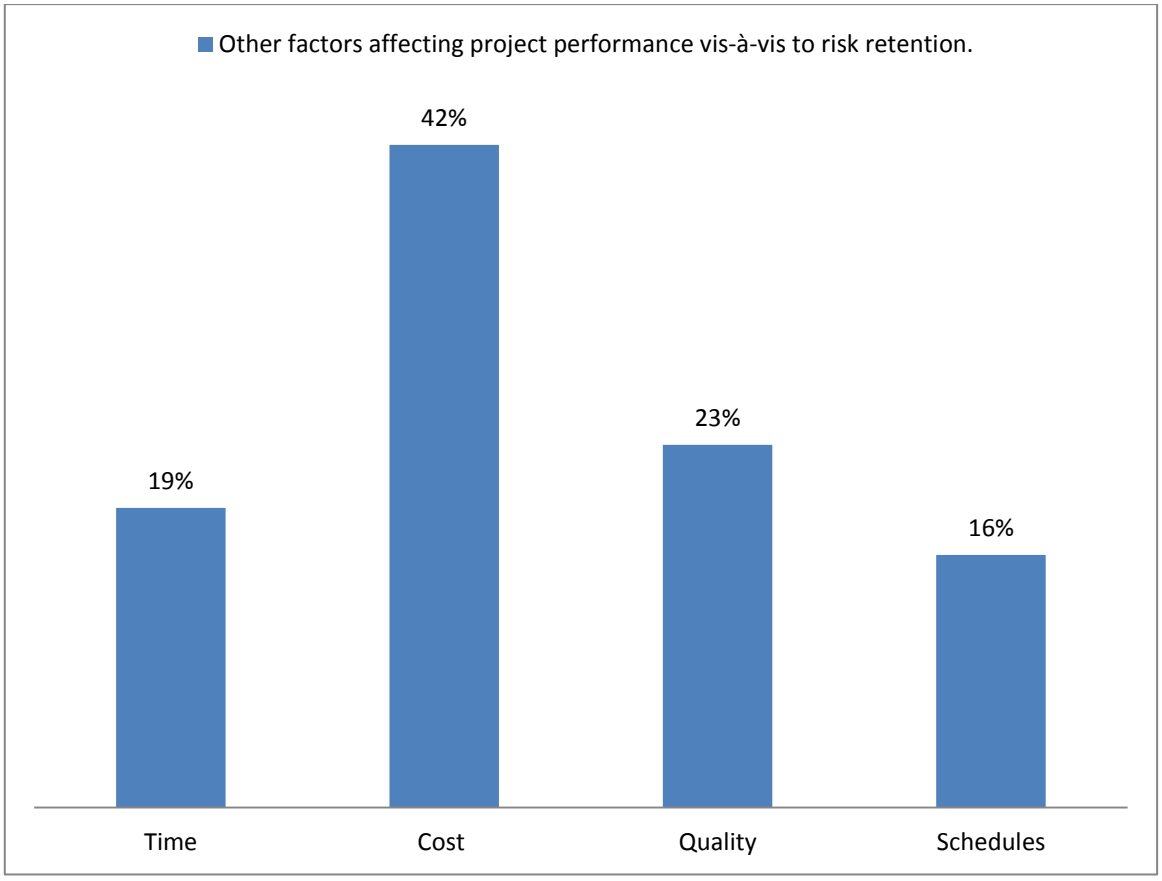

Figure: 4.5.4. Other factors affecting project performance vis-à-vis to risk retention

4.6. Analysis on the influence of risk transfer on project performance in Rwandan construction industry.

Contractual risk transfer is a technique for allocating the risks associated with the performance of the endeavor governed by a business contract between the contracting parties. At least in theory, the objective for this risk allocation should be to assign the risk to the party with the most control over it. Risks are allocated through the use of various types of contract clauses, including, but not limited to indemnity (also called "hold harmless") clauses and insurance clauses. Indemnity clauses require one contracting party to respond to liability claims made against the other party by third parties who are not involved in the contractual arrangement.

It is common practice in Rwandan construction industry for project owners to transfer liability risks to the prime or general contractors and for prime or general contractors to transfer them down to subcontractors. Thus, indemnity clauses typically are used to push liability exposures downstream from one tier to the next. In many situations, this is logical as each contractor should be responsible for controlling and financing the risks resulting from its operations. However, indemnity agreements sometimes result in transfers that are unfair to the downstream parties, as when one subcontractor must fund liability arising at least in part from another contractor's negligence. Insurance clauses assign responsibility for purchasing certain types of insurance to the parties to the contract. The objectives of insurance clauses are:

- To assure coverage is purchased for certain mutual exposures of all the parties (e.g., damage to the project during construction) while reducing inefficiencies from multiple parties buying overlapping coverage;
- To ensure that parties who have agreed to indemnify others have insurance in place to cover liability transferred to them within the indemnification agreement, and
- To assure that contracting parties have insurance in place to cover liability to one another.

In RSSB construction contracts one party, generally the prime contractor might buy builders risk insurance on behalf of all the other parties. This is an efficient way of covering the direct and indirect property exposures associated with the project without creating the coverage overlaps that would occur if each sub-contractor tried to insure only its risk. Each sub-contractor is then generally required to purchase certain casualty coverage's, such as commercial general liability, workers compensation, and auto liability.

Obtaining some protection through another party's liability insurance should be viewed as a way to insulate the transferor's liability insurance program from loss rather than as a replacement of its liability insurance program. On the other hand, contract requirements are often used to avoid the necessity of both parties purchasing first party insurance on the same property. In RSSB construction projects, appropriate evidence that coverage has been purchased – usually in the form of an insurance certificate – should always be presented and maintained to verify compliance with the contract. Of course, many other contract provisions may allocate risks to one or more of the contracting parties. For example, it is common for construction contracts to include special provisions related to environmental liability, liquidated damages, and force majeure clauses. Thus, it is necessary to carefully review the entire contract to obtain a clear picture of the risks being transferred. Since risk allocations in contracts radically alter the risk profile of construction projects, contractors and their insurance advisors must pay careful attention to them and actively negotiate for fair treatment. This involves determining what risks the contractor will accept from others and what risks it will not accept. It also involves knowing what insurance requirements will be acceptable and avoiding contract provisions that require coverage that are not available or are simply unacceptable. Once these determinations are made, a process for reviewing and negotiating these contract provisions are put in place. This will often require reviews by knowledgeable risk or insurance specialists before contracts are executed.

4.6.1. Reasons of transferring risks

Risk transfer is a risk reduction method that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk transfer method. The risk is transferred from the project to the insurance company. RSSB multi-storey project purchased construction site insurance that would cover the cost of any uncertainty damaging the construction site. The purchase of insurance is usually in areas outside the control of the project team. Weather, political unrest, and labor strikes are examples of events that can significantly impact the project and that are outside the control of the project team. The respondents talked about the reasons of transferring risks where they argued that it is notably from the nature of work.

The table 4.6.1 displays the reasons to which risks should be transferred. It is about client's wish, nature of work, previos experience and other reasons.

Table: 4.6.1. Responses on other factors affecting performance

Reasons of transferring risks	Frequency	Percentages
Previous experience	6	5%
Nature of work	54	45%
Client's wish	36	30%
Project manager's decision	24	20%

Source: Primary data (2015)

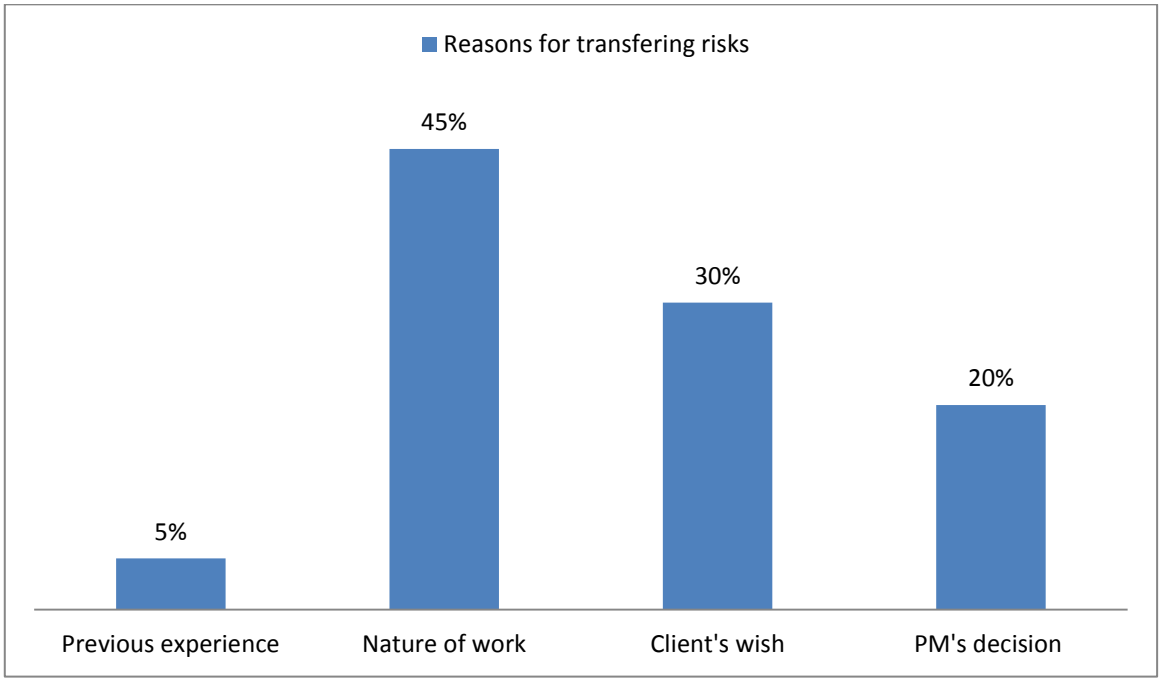

Figure 4.6.1 Reasons for transferring risks

4.6.2. Relationship between risk management methods and project performance

The respondents talked about the relationship between the two variables where they argued that independent variable affects directly the independent one positively.

The table 4.6.2 displays te extent to which the risk transfer has impact on the project performance. Using Pearson correlation coefficien, the result is r equals to 0.853. When Pearson

correlation coefficient is zero, then there is no relatioship between the given variables, between zero (0) and 0.5, the correlation is weak,0.5 – 0.79 the variables are strongly correlated. In case Pearson correlation r is above 0.8, it means the variables are positively,strongly and perfectly correlated. Therefore, the researcher concluded that risk transfer has extrem positive relationship on the project performance in Rwandan construction industry.

Table: 4.6.2. Responses on relationship between risk management methods and project performance

		Risk management methods	**Project performance**
Risk management methods	Pearson Correlation	44.2	0.853
	Sig. (2-tailed)		.000
	N.	78	78
Project performance	Pearson Correlation	0.853	1
	Sig. (2-tailed)	.000	
	N	78	78

Correlation is significant at the 0.01 level (2-tailed)
Source: Primary data (2015)

4.6.3. Other factors towards project performance

Under this research we had deeply analyzed and found the reasons for the underperformance of the quality of Rwandan construction projects and we suggested possible remedial measures. A research survey identified 14 attributes responsible to impact performance of the projects.

Further analyses of individual sets of success attributes and failure attributes separately grouped them into fewer critical success and failure factors. The critical success factors obtained were: project manager's competence; top management's support; monitoring and feedback by project participants; interaction among project participants; and owners' competence.

The factors that adversely affected the performances of projects were: conflict among project participants; hostile socio-economic environment; harsh climatic condition; PM's ignorance &

lack of knowledge; faulty project conceptualization; and aggressive competition during tendering.

Analyses also led to the conclusion that the extent of contribution of various success factors varies with the current performance ratings of the project. Project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project. As in the manufacturing industry, the study establishes that management plays an important role in achieving quality even in construction projects.

In RSSB multi-storey construction project, here are the 14 summarized components (factors) which were found as outcome, hence affect performance, and respondents were freely to discuss and rate accordingly.

Open communication between the actors, effective coordination towards risk management, attitudes of the project actors (trust and commitment), joint responsibilities, personal responsibilities, established process for dispute resolution, frequent meetings, readiness for compromises, opportunities for future cooperation, effective information exchange between the actors, fair and open allocation of identified risks, fair and open allocation of unforeseen risk.
The findings were summarized in the below table and figure 4.5.1.

Table: 4.6.3. Responses on other factors affecting performance

Other factors affecting performance	Frequency	Percentages
Strongly disagree	17	14%
Disagree	27	22%
Agree	43	36%
Strongly agree	33	28%

Source: Primary data (2015)

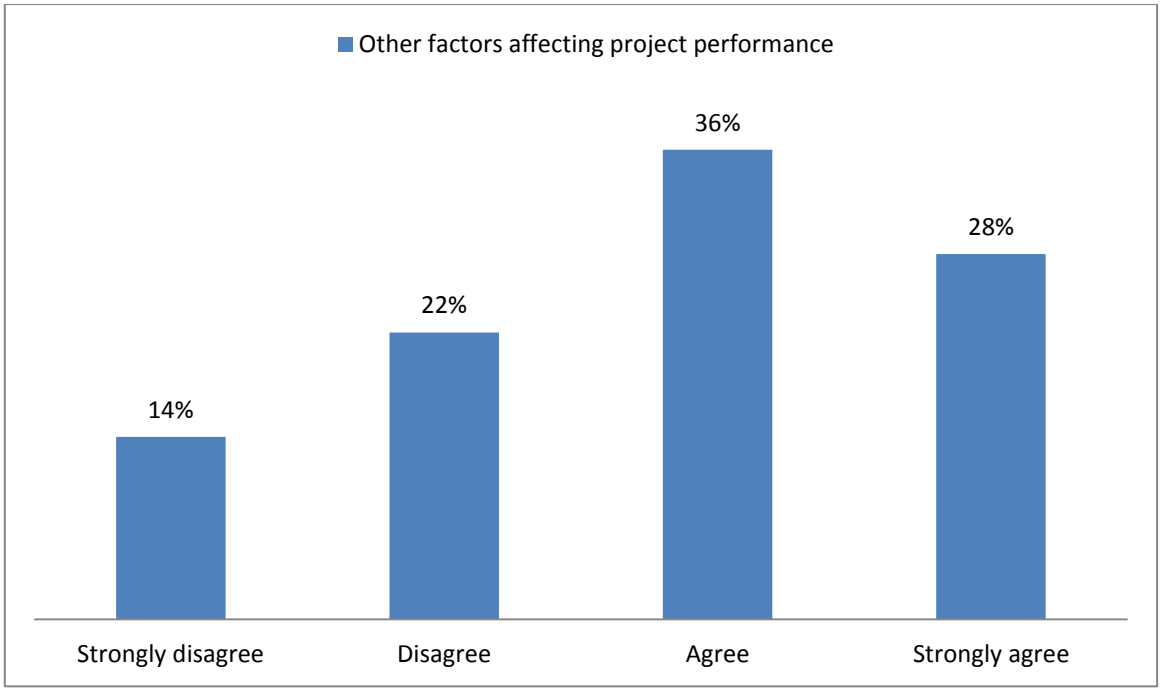

Figure: 4.6.3. Other factors affecting project performance

4.6.4. Handling risk in construction project

In order to manage the RSSB multi-storey construction project, handling risk is being used as one of the essential parts to the project performance. The purpose of risk handling is to add value to project delivery and to improve efficiency during practice.

During this study, the researcher found that risk handling as a systematic approach involving many steps to be followed in order to handle risk.

First step in risk handling is making risk management strategy. This must be adopted at the time of project planning stage to ensure the effective risk management throughout the project lifecycle. The second step is identifying the risks associated with the project. This can be achieved using several methods such as brainstorming, prompt list, checklist, work breakdown structure, Delphi technique, or by asking expert.

Third step is assessing the risk to evaluate the effects of each risk on the project. It can be evaluated based on the possibility of risk occurrence and severity of its impact by developing risk matrix. Fifth step is negotiating each risk amongst the parties involved in risk management process. It normally takes place after signing the contract. This is the most important step to handle risk as it reflects the risk management assessment updates continuously.

Throughout this research respondents views were mainly centered on the above points, where most of them agree with the approaches and findings are presented in the below table and figure 4.6.4.

Table: 4.6.4. Handling risk in the construction project

Handling risk in the construction project	Frequency	Percentages
Very bad	11	9%
Fairly bad	13	11%
Fairly good	53	44%
Very good	43	36%

Source: Primary data (2015)

Figure: 4.6.4. Handling risk in the construction project

CHAPTER 5

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

5.0. Introduction

The purpose of this chapter is to highlight the key points of research findings, draw conclusions about risk management methods to the project performance in Rwandan construction projects, provide recommendations and suggest the further areas of researches.

This chapter brings out the research results and discussions. Data is hereby presented in line with the methodology of the study described in chapter three above while the discussions are guided by the results of the study.

5.1. Summary of findings

The primary objective of this study was concerned with the effect of risk management methods to the performance of the project in Rwandan construction precisely in RSSB Multi-storey project.

For this main objective to be met there were four specific ones as follows:

- To study the influence of risk avoidance or prevention on the performance of construction project in the Rwandan industry, how frequent risk management methods are being applied during the project life cycle;
- To assess the influence of risk control (loss control or risk mitigation) on the project performance in Rwandan construction industry, it is also known as risk sharing or cost sharing;
- To evaluate the effects of risk retention on the project performance and;
- To analyze the influence of risk transfer on the project performance in Rwandan construction industry

To get necessary information concerning the mentioned objectives, the researcher worked closely with the respondents through various ways such as questionnaires and interviews which got answered by the respondents from RSSB multi-storey project.

The respondents were the permanent employees who their occupation is real estate construction department and others were engineers' professionals belonging to four (4) companies which were part of multi-storey buildings project. The respondents were categorized in groups basing on their education and experience levels. For the education level, 60% were educated at university level, 27% had post graduate level. This facilitated the researcher to deal with the high educated respondents and to use modern communication channels internet based and no complication uncounted concerning the questionnaire. Regarding their areas of specialization or working areas, 44% were in the project implementers' team and 23% were project management team members.

The engineers and architects were there and the respondents were generally matching with the intended objectives as there was representative team in every field. For the experience, the large number of 23% has been working in road construction industry between 0 and 5 years whereas 44% have been working there between 6 and 10 years. This gave the researcher the assurance that the information provided by the respondents was reliable enough.

5.1.1. Finding related influence of risk management methods on the performance of construction project in the Rwandan industry.

In the previous chapter we presented the results of the questionnaire survey. In particular we focused on the following issues: the impact of risk management methods on project performance, importance of risk management in different phases, actors' participation in the project phases, risk mitigation measures through the phases, collaboration in managing risks and influence of the project performance. This section aims at discussing the results and developing directions for future research.

We found that participation in the different phases of a project was governed by the actors' roles in the construction process. In general all parties (contractor, client, consultants and architects) played equally to manage and mitigate project risks in conformity to the appropriate method or approach.

Managing risk starts from production which was the phase where the majority of respondents participated, while the participation in the program phase was very low. Neither contractors nor clients were sufficiently involved in the program phase. The planning and production phases

were identified by all actors as the most important for risk management. In these phases risk avoidance, risk transfer and risk retention were mostly performed.
The results of the survey show that the use of appropriate risk management method in risk management processes are strongly connected to performance of the project. Thus risk avoidance, risk transfer and risk retention were mostly performed: in the program phase by the client; in the planning phase jointly by the client and the consultant; in the procurement and production phases mostly by the contractor. The planning and production phases are those where joint risk management methods were mainly used by the actors. We suggest that the procurement phase should play a more important role in joint risk management method. The risk management methods in the project should be based on the actors shared view of what the risks are and who should carry them.

One model might be that the client prepares its view on the risk management methods aspects of the project and the tendering contractor responds with its respective risk analysis and approach. The total picture of the client's and the contractor's risk mitigation and analyses and a shared insight will then form the basis of a conscious risk management method and risk allocation in the contract. There is a clear indication that collaboration through all phases of the project increases the probability that a specific risk is managed by the actor who has the best corresponding qualification with fitting tactic.

5.1.2. Finding related the use of risk management methods towards performance of construction project in the Rwandan industry.

Use of risk management methods was also evaluated high by all actors and was most intensive in the production phase. On the contrary, evaluations of actors' communication of known risks in the procurement phase are low. In particular the contractors state that the client communicates the risks method on a low level. Collaboration between actors was very strong in the risk avoidance and risk transfer methods. In the cost sharing or risk control method the degree of collaboration decreases significantly according to the contractors' opinion. This indicates that the project's actors protect own interests and try to transfer the identified risks to other actors.

According to our studies contractors were most active in performing risk avoidance, transfer and retention systematically in the project. Moreover, they had the largest influence on risk management in the project from the perspective of all actors. Consultants had very low influence

on project risk management method. They were not familiar with risk avoidance, risk retention and risk transfer but very aware on cost sharing approach.

However, it is difficult to generalize the results because the consultant group is very small in the sample. We suggest that the consultants should be involved more in risk management because design is a very significant risk source in a construction project.
Finally, we came across to notice that it is also important to understand that other factors are moreover to be considered to the performance of a project.

5.2. Conclusions

The focus of the study was to examine the effect of risk management methods on project performance in Rwandan construction industry. To assess the benefits of using risk management methods in construction industry, to identify the relationship between risk management methods and project performance.

Considering the facts that risk management methods have influence on project's goals in the form of quality, time and cost, it should be an open and conscious process through all phases of the project. The aim of the paper was to examine the influence of risk management methods on project performance in construction industry and extent to which the actors are involved in risk management methods through the different phases of the project towards the performance.
For this purpose we conducted a questionnaire survey of clients, contractors and consultants. The overall conclusion is that, according to project actors, risk management methods are strongly linked to the performance of the project in terms of quality, time and budget or cost.
Most of risk management methods should be performed in the different phases and contractors tend to be the most active group with a large influence on the risk management process.

5.3. Recommendations

The research was concerned with the effect of risk management methods to the performance a project in construction industry. It is in this regard the recommendations were availed basing on research findings, conclusion as well as study area.

5.3.1. To the Government

Government should be aware that risk management methods are the dynamic project tool especially in construction projects. It should be very careful to avail the supervisor of the construction works to ensure that risk management methods are being conducted to prevent post completion defects and excessive costs. It will ease work and also monitor and emphasize on tender process to offer such tenders of construction projects basing on assessed risk management methods as it might lead to the poor quality when the winner do not have required competitiveness.

5.3.2. To the project managers

The project managers should ensure that risk management methods is conducted not as routine activity but needed project management tool to perform the project effectively and efficiently. The rest of the project team should know the importance and reason of conducting risk management methods and how frequent it should be conducted depending on the nature of work.

5.3.3. To the project team

The benefits of risk management in projects are huge. Its success can gain a lot of money if dealt with uncertain project events in a proactive manner. The result will be that minimizing the impact of project threats and seize the opportunities that occur. This allows project team to deliver project on time, on budget and with the quality results project sponsor demands. Also team members will be much happier if they do not enter a "firefighting" mode needed to repair the failures that could have been prevented.

5.3.4. To the project partners or resources providers

The partners should let the beneficiaries participate in the activities as they are the one who know what they need and the exact specification. They should also make sure that the post completion satisfaction of the users is met not only receiving physical end result of the project and think that everything is fine.

5.4. Suggestions for further Research

The study was carried out as the effect of risk management methods on project performance in Rwandan construction industry in RSSB multi-storey project. However, the further research can be conducted on impact of risk management process on the delay in public building projects.

REFERENCES

Abdel-Razek, R.H. (1997). How Construction Managers would like their Performance to be evaluated. *Journal of Construction Engineering and Management*, ASCE, 123 (3), pp. 208-213

Abdulaziz, A. B.,Member, A., & Tawfiq, H. A. (1999). ISO 9000 Quality standards in construction. *Journal of management in engineering*

Alberto,M. & Timur,N. (2013).Earned value – based performance monitoring of facility construction projects. *Journal of facilities Management*, 11 (1), 69-80.

Ali,S.N. Kamuruzzaman,2010.*Cost performance for building construction projects in KlangValley.Facult of Built environment*, University of Malaya.asafab@um.edu.my

AmaniSuliman Bu-Q,2007. *Risk assessment of International construction Projects using the analytic Network Process*. School of natural and applied sciences. East Technical University.

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, 17(6), pp. 337-342

Bititci, U.S. (1994). Measuring your way to profit. *Management Accounting*, 32 (6), pp.16-24
Brenda,G.(2008). The target population. Sage research methods

Cameron, K.S., & Whetten, D.A. (1983). *Organisational Effectiveness: A Comparison of Multiple Models.* New

Chan, A. P.C., Scott, D. and Lam, E.W.M. (2002). Framework of Success Criteria for Design/Build Projects. *Journal of Management in Engineering,* ASCE, 18 (3), pp. 120-128

Best Practice indicators for Public Procurement, Scotland 2008.

Cleden,D,; 2009. *Managing project uncertainty*. Abingdon Ashgate Publishing Group.

Damien Schatteman, 2004. *A methodology for integrated risk management and proactive scheduling of construction project*. Faculty of Economics and applied Economics. Belgian Building Research Institute (BBRI).

Ekaterina Osipova. *Risk Management in Construction projects*: a comparative study of the different procurement options. Construction Management Research Group. Lulea University of Technology.

Ewelina G.;Mikaela R; 2011. *Risk management practices in a construction Project*. Department of Civil and Environmental Engineering. Chalmers University of Technology. Sweden

Expert Group report, 2010.*Risk management in the procurement of innovation, Concept and empirical evidence*. European Union.

J.WALEWSKI, 2003. *International, Project risk assessment methods, procedures and critical factors*. Report N^0 31. Center construction industry studies. The University of Texas at Austin.

Mehdi Tadayon et al, 2012. *Journal of Construction in Developing countries, an assessment of identification in large construction projects*.

Nancy Thayer-Hart, 2010.*Office of quality improvement*. Madison

Nerija Banatienne and AudriusBanaitis, 2012. *Risk Management in construction Projects*. Department of Construction Economics and Property management. Faculty of Civil Engineering Vilnius Gediminas Technical University.

Norris, 2004. *Global body of project Management knowledge and standards*. Lynn Crawford

Patric Z.;Zhang;J-Y Wang. *Identifying Keys Risks in construction projects*:*Life Cycle and Stakeholder Perspectives*: Sydney: Faculty of Built Environment, University of New South Wales.

Pejman.Rezakhani,2012. *Current state of existing project risk modeling and analysis methods with focus on Fuzzy risk assessment*. School of civil and Architectural engineering. Kyungpook National University. Korea. rezakhani@knu.ac.kr

PMI (Project Management Institute), 2004. A *guide to the project management board of knowledge*: PMBOK.3rd edition. Pennsylvania: Project Management Institute, Inc.

Project Management book of Knowledge, 2004.*Risk response strategy*. Third Edition

R.C. Walke et al, 2011. An approach to *risk quantification in construction projects using EMV analysis.* International Journal of engineering Science and Technology (IJEST).

S. Khumpaisal and Zhen Chen,2009. *Risks assessment in Real Estate Development: an application of analytic Network process*. School of Built environment. Liverpool, United Kingdom

APPENDICES

Appendix I: Questionnaire for data collection.

TOPIC: EFFECTS OF RISK MANAGEMENT METHODS ON PROJECT PERFORMANCE IN RWANDAN CONSTRUCTION INDUSTRY

Dear respondent,

This questionnaire is for academic purpose only. It is designed as one of the tools for collecting data concerning the subject matter. Please answer the questions laid down to the best of your knowledge; while attaining on one or more answers some of the questions require answers "yes" or "no". And others require your own comments. Be insured that this information will be confidential and used for academic purpose only as indicated above. It takes approximately 15 minutes to answer the questionnaire.

Thank you.

SIBOMANA Aimable

Student at JKUAT

1. **General questions**

a. Gender of the respondent

Male ☐ Female ☐

b. Age of the respondent

21-30 ☐

31-40 ☐

41-50 ☐

50-Above ☐

c. Academic Level

Secondary Certificate (A Level) ☐

Diploma ☐

Bachelor ☐

Postgraduate ☐

Other (Specify)……

d. Marital status of respondents

Single ☐ Married ☐ Divorced ☐

e. Company / organization: ……..

What is your Role in multi storey buildings: ……

Client – representative ☐

Client - project manager ☐

Client- project finance manager ☐

Client- Supervisor ☐

Client- Site engineer ☐

Client- Quality engineer ☐

Client- Quality engineer ☐

Client-Electrical Engineer ☐

Client-Structural Engineer ☐

Client-Architectural Engineer ☐

Contractor - representative ☐

Contractor - site manager ☐

Contractor - estimator ☐

Consultant ☐

Design manager ☐

Other Specify: ……..

f. How long have you worked in the construction industry?

0-5 ☐

6-10 ☐

10-15 ☐

15-Above ☐

g. How do you evaluate your knowledge of risk management?

Very bad ☐ Fairly bad ☐ Fairly good ☐ Very good ☐

2. Question related to the objectives of the research.

a. Question related to the objective one. To study the effects of risk avoidance or prevention on the performance of construction project in the Rwandan industry

1. In construction project which area does risk avoidance/prevention influence your performance?

- ✓ To ensure quality ☐
- ✓ To ensure customer satisfaction ☐
- ✓ To manage resources ☐
- ✓ To ensure with project plan ☐

2. How frequent do you apply risk avoidance/prevention method (approach) in Multi-storey construction project?

- ✓ Weekly ☐

- ✓ Monthly ☐
- ✓ Quarterly ☐
- ✓ Other? Specify ……

3. **why did you choose risk avoidance/prevention as an approptiate approach for your project?**
   - ✓ Project manager's decision ☐
   - ✓ Client's wish ☐
   - ✓ Nature of work ☐
   - ✓ Previous experience ☐

4. **Who is responsible?**
   - ✓ Contractor ☐
   - ✓ Client ☐
   - ✓ Consultants ☐
   - ✓ Other? Specify ……

b. Question related to objective 2. To assess the influence of risk control (loss control) on the project performance in Rwandan construction industry

1. **What are the criteria do you consider as measures of risk control vis-à-vis to project performance?**

- ✓ Project cost ☐
- ✓ Project completion time ☐
- ✓ Client satisfaction ☐
- ✓ Quality of the project ☐

2. **At which percentage do you think risk control regulate project performance?**

- ✓ 10-30% ☐
- ✓ 30-50% ☐
- ✓ 50-70% ☐
- ✓ Above 70% ☐

3. **Do you admit that risk control/loss control influence project performance?**

- ✓ Strongly Disagree ☐
- ✓ Disagree ☐
- ✓ Agree ☐
- ✓ Strongly Agree ☐

c. Question related to objective 3. To evaluate the effects of risk retention on the project performance.

1. Have you faced any of these challenges which may have been caused by lack of risk retention method within Multi storey construction project?

- ✓ Project delay ☐
- ✓ Excessive cost ☐
- ✓ Contractor-client conflict ☐
- ✓ Bad quality ☐

2. Do you acknowledge that risk retention method had impact on performing the multi-storey construction project?

- ✓ Strongly Disagree ☐
- ✓ Disagree ☐
- ✓ Agree ☐
- ✓ Strongly Agree ☐

3. At which percentage do you think risk retention affected your project performance?

- ✓ 10-30% ☐
- ✓ 30-50% ☐
- ✓ 50-70% ☐
- ✓ Above 70% ☐

4. What are other factors contributed to project performance vis-à-vis to risk retention?

- ✓ Time ☐
- ✓ Cost ☐
- ✓ Quality ☐
- ✓ Reduces schedules ☐

d. Question related to objective 4 To analyze the influence of risk transfer on the project performance in Rwandan construction industry

1. Why did you choose to transfer risks?

- ✓ Clients' wish ☐
- ✓ Nature of work ☐
- ✓ Previous experience ☐
- ✓ Other? Specify …….

2. After transferring risk, have those criteria and factors contributed to project performance?

- ✓ Strongly Disagree ☐
- ✓ Disagree ☐
- ✓ Agree ☐
- ✓ Strongly Agree ☐

3. Does lack of risk transfer affect project performance?

- ✓ Strongly Disagree ☐
- ✓ Disagree ☐
- ✓ Agree ☐
- ✓ Strongly Agree ☐

e. Question related to relationship between Project performance and risk management methods.

1. **Do you admit that risk management methods are enough to better performing a project?**
   - ✓ Strongly Disagree ☐
   - ✓ Disagree ☐
   - ✓ Agree ☐
   - ✓ Strongly Agree ☐

2. **What can be other factors to better performing a project?**
   - ✓ Tender process ☐
   - ✓ Skills of works and management of site challenges ☐
   - ✓ Project planning ☐
   - ✓ Other? Specify……..

3. **Have you used any methods to analyze risks?**

✓ If yes, what methods?

……

✓ If no, what are the reasons of not using any methods?

……..

✓ If you use/will use methods, what do you think is the most desired outcome, what do you expect?

……

✓ Project performance and risk management methods are they correlated? Yes? ☐ No? ☐

If yes, how?……

If no, why?.....

Thank you for your valuable contribution to the success of this research.

APPENDIX II: INTERVIEW GUIDE

1. What is your level of education?
2. How long have you worked in construction industry?
3. Did you study risk management or project management?
4. How do you evaluate your knowledge on risk management?
5. How do you evaluate the use of risk management methods in the phases of the project?
6. Why did you risk avoidance as an appropriate method for your project?
7. Is there any relationship between risk avoidance and project performance?
8. At which percentage risk avoidance influences project performance?
9. What is the impact of risk control on project performance?
10. How does risk retention influence project performance?
11. Does risk transfer have an impact on project performance?
12. How do you handle risk within your organization/project?
13. What are other factors contributing to project performance?

APPENDIX III: DOCUMENT REVIEW GUIDE

1. RSSB, Multi-storey project Annual and quarterly reports 2012 – to date.
2. All RSSB project reports 2012 - 2014.
3. Newspaper, magazine and journal articles about Rwandan construction industry
4. Relevant text books
5. Relevant internet source