KYAMBOGO UNIVERSITY

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INVESTIGATING RISKS MANAGEMENT ON CONSTRUCTION PROJECTS IN UGANDA: A CONTRACTOR'S PERSPECTIVE

BY

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DECLARATION

By signing this document, I, AKUNOBERE JACOB, hereby affirm that this dissertation original with no submissions to other organizations or universities for consideration of academic awards.

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CERTIFICATION

In order to complete the requirements for Kyambogo University's Master of Science in Construction Technology and Management, the undersigned hereby attests that they have read the dissertation titled "Investigating Risk Management on Construction Projects in Uganda; A Contractor's Perspective" and suggests that the university accept it.

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Signature: ………………………………………...Date: ……………………….

DEDICATION

This dissertation is dedicated to my loved ones, especially my children and my late parents may they rest in peace as well as to all those who experience the strains and pains of trying to ensure their children reach a successful outcome.

ACKNOWLEDGEMENT

I would especially like to thank the Almighty God for enabling me to finish my research dissertation. Second, I appreciate my family for allowing me the time to write this dissertation while you take care of your duties at home, my research supervisors, Dr. Lawrence Muhwezi and Eng. Mubiru Joel, my lecturers, and my students for providing me the motivation and reasons to do so. Thirdly, I want to thank everyone mentioned above for having the bravery and moral support to see this research dissertation through to its completion. I pray that everyone receives the abundant blessings of the All-Powerful God for their altruistic support in assisting me in producing this study dissertation.

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
HLT	High labour turnover
ICE	Institute of Civil Engineers
ISO	International Organization for Standardization
MRD	Mission Risk Diagnostics
LoCI	Loss of the company image
PCO	Project Cost Overruns
PMI	Project Management Institute
RMP	Risk Management Plan
PQO	Poor quality output
SCG	Slow Company Growth
SD	Schedule Delays
SPSS	Statistical Program for Social Scientists
WGP	World Gross Product
WTO	World Trade Organization
US	United States
USA	United States of America

ABSTRACT

In order to successfully manage construction projects, contractors must effectively manage risks involved on these projects. Construction projects typically include an arbitrary contingency number of 10% to control risk, which does not adequately handle the unidentified risks that have an impact on contractors. This study sought to investigate how risk management is handled on building projects. Eighty respondents from carefully chosen contractors in the Masindi District and central Kampala were taken into consideration in order to collect empirical data for the study. The research methodology used in the study was descriptive. In order to facilitate respondents' comprehension and enable correct responses, the data was gathered using self-administered questionnaires that included both closed-ended and open-ended questions. Regression analysis, means, and frequency tables were used to examine the data. The study identified the following as common risks related to the execution of construction projects; negligence in inspection, labor and resource shortages site conditions, inadequate project management and unknown site conditions. The study established that the risk of project cost overruns had the highest effect associated with implementation of construction projects. Other risk factors with high effect included: schedule delays, loss of company's reputation, slow business growth, high labor turnover and poor-quality output. A contractor’s risk management tool was developed as a regression equation; which can be used to track the effects of risk management in construction projects. It is envisaged that this tool will guide project managers in decision making on which parameters to pay more attention to in implementation of projects.

Key words: Risk, Management, Construction Projects, Contractor, regression.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Because it requires people to plan and execute projects on time, building is perceived as riskier globally than other technological specialties. Construction is risky because of many factors, including intense competition for jobs, low profit margins and risks, pressure to save money and time, late project completion, cost and time overruns, high levels of disputes and litigation, and unsafe working conditions, according to Olander (2007). Construction projects often include an arbitrary contingency amount of 10% to decrease risk, however this is insufficient to handle the unknown risks that have an impact on contractors' performance.

Uncertainties, liabilities, or weaknesses that could result in a construction project deviating from its specified plan are referred to as risks (Nixon, 2009). An alternative definition is the "likelihood of a substance, activity or process causing harm to an individual" as stated by Hug-Hes and Fenett, (2007). Every risk is, in theory, proportionate to the expected losses that can result from a dangerous occurrence and to the likelihood of this happening.

Risk identification, risk analysis, risk response, and risk classification are the four phases in the risk management process. Retention, reduction, transfer, and avoidance are the four components of the risk response (Flanagan & Norman, 1993; Berkeley, 1991). Because risk management is becoming more and more important, most sectors today view it as essential. To limit the affects that prospective hazards bring, a number of strategies have been created (Baker & Reid, 2005). But this study provides a risk-management tool that looks for the underlying causes of uncertainties and hazards to determine how they will impact the situation and develop a suitable risk management plan.

Risk management, according to research, aims to lessen the possibility of unanticipated occurrences on construction projects that affect the contractor by identifying and addressing such risks before they have a significant negative impact (Akintoye & MacLeod, 1997). Risk management at the construction project level includes the processes, policies, and procedures utilized by project personnel in the identification, analysis, management, and response to any project risks that could directly influence the contractor. On the other hand, risk management in the context of construction project management denotes a methodical and comprehensive strategy to identifying, assessing, and mitigating risks in order to achieve project objectives (ICE & AP, 2005). Most construction projects require risk management because of their hazardous nature regarding structure, financial and organizational structures, technology, and resource demand (Edward & Bowen, 2005).

By identifying which portion of the project is more vulnerable to risk and less viable, it is crucial to understand the impact by minimizing these risks (Zayedetal, 2002). According to a study by Brenger and Justus (2016), the task of risk management will involve the following: risk identification, probability measurement, the likely impact of events, and risk treatment, eradication, or minimization with minimal resource investment. Risks and uncertainties can have damaging consequences for construction projects as stated by Franagal, (2006). Hazard or risk management is a crucial part of project management for construction projects in order to efficiently handle uncertainty and any unforeseen events. This study looked at how Ugandan construction industry professionals felt about risk control procedures.

1.2 Problem Statement

To achieve a balance between the factors of time, quality, cost, scope, and conflict on building projects, risk management is crucial. However, according to parties involved in construction projects in Uganda, most projects do not conform to the original plan, they experience challenges that lead to delays, cost overruns, premature termination of contracts and compromise of quality partially due to unforeseen risks encountered which are poorly managed and without appropriate mitigation measures. Like Breger and Justus (2016); Zayedetal (2002) observed the existing risk management tools seem to be inappropriate and not user friendly to Ugandan contractors. The contractors are in a state of uncertainty on the project success and hardly do they realize the project objectives due to the immense unmitigated construction risks. In order to reduce the risks faced by contractors, this research sought to investigate risk management techniques used on construction projects basing on the contractors' perspectives.

1.3 Research Objectives

1.3.1 Main Objective

This study investigated risk management techniques used on construction projects in from the contractor's perspective in order to mitigate construction related risks in Uganda.

1.3.2 Specific Objectives of the Study

The study was guided by the following specific objectives: -

i. To determine the risks associated with Ugandan contractors carrying out construction projects.
ii. To ascertain the effects of risks on contractors working on Ugandan construction projects.
iii. To develop a user-friendly contractor's risk management tool for construction projects in Uganda.

1.4 Research Questions

i. What risks do contractors encounter while implementing construction projects?
ii. To what extent do risks in construction projects affect contractors in Uganda?
iii. How can risk management for building projects in Uganda be improved?

1.5 Justification of the Study

Risk management is vital in ensuring successful completion of construction projects. Preliminary investigations have indicated that contractors are inadequately equipped with skills of risks impact assessment besides having no user-friendly risk management tool. The issue is made worse by the fact that there aren't many studies that focus on the same threats that contractors in the local construction industry confront. This issue needs to be taken seriously in order for contractors working on construction projects in Uganda to reach their full potential and goals. The aim of this study was to investigated risk management techniques used on construction projects in from the contractor's perspective in order to mitigate construction risks in Uganda.

1.6 Significance of the Research

Contractors need a motivated staff with projects being completed as scheduled. Socially, the research was helpful in reducing the negative health consequences that workers on the construction project were exposed to for example injuries, poisoning, machine breakages, and wastage of materials and poor utilization of time. On the part of academics or education, it aided in the dissemination of knowledge to students studying engineering as well as the use of the research dissertation as a source document for additional research.

1.7 Research Area

1.7.1 Content Scope

The primary goal of the study was to find out how Ugandan contractors see risk management in construction projects. It also examined the difficulties faced by contractors, including risk analysis related to cost overruns, poor time management, mishaps, project termination, abuse, and material and financial theft. The primary targets were contractors working on construction projects involving buildings.

1.7.2 Geographical Scope

The study which was conducted regionally with building contractors based on their training and experience, used data from the Uganda National Association of Building and Civil Engineering Contractors (UNABCEC). Selected contractors from each of the four central and western regions of Kampala and the Masindi District were chosen to participate in this research as a representative sample due to the complexity of the projects undertaken to help with data collection.

1.7.3 Time Scope

The research was conducted in the course of eight (8) months, with sporadic breaks brought on by the Covid-19 pandemic. This included creating interview guides and questionnaires, distributing them, and conducting data collecting and analysis up until the creation of the final report.

1.8 Conceptual Framework

The use of the three risk management techniques—the technical, psychological, and social-cultural approaches—as well as a systems-based risk management system are discussed as the four essential components that might enhance the risk management process for construction projects. These components consist of the "individual system, work environment system, organizational system, and institutional system." Every system furthermore has sub-variables. The conceptual structure of the study (Figure 1.1) offers illustrations of the essential elements and auxiliary variables.

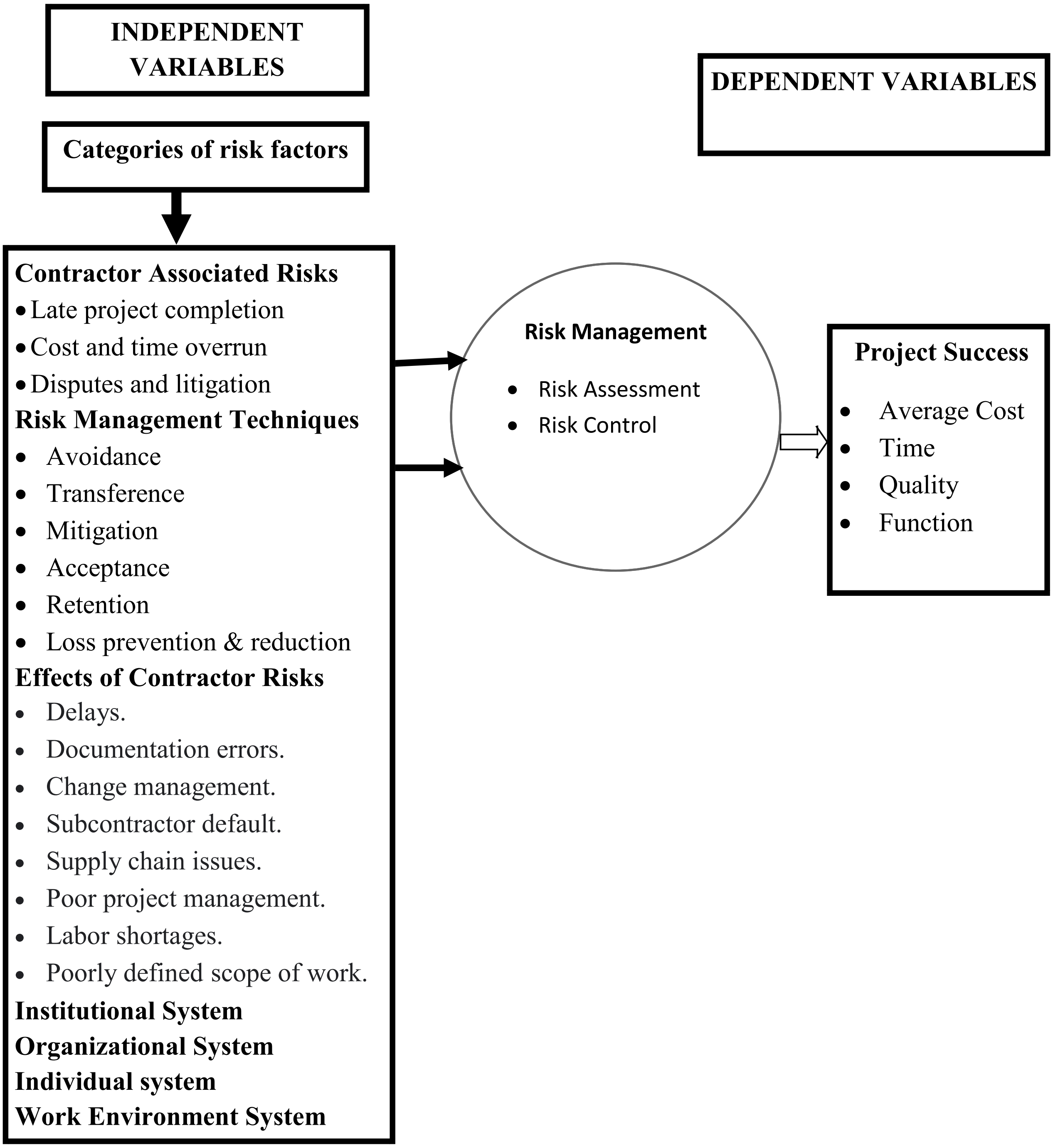


Figure 1.1: Conceptual framework for the study

Figure 1.1 depicts the study's conceptual structure. The diagram shows how several elements, such as organizational culture, individual systems, and work environment, have an impact on risk management.

1.9 Chapter Summary

The study's background, problem statement, research aims, and questions have all been presented in this chapter. Additionally, presented is the study's significance, the project's scope, and the conceptual underpinning for the research. This chapter's major point is that the following factors have an impact on risk management for building projects in Uganda:

i. Values.
ii. Regulatory aspects (such as regulations and standards).
iii. Cultural influences.
iv. Organizational elements, such as the dedication of the company's directors and senior managers.
v. Individual elements include perception, prior experience, power dynamics, and relationships of trust as well as workplace environment aspects including equipment, resources, working groups, and physical space.

The associated literature review on risk management in construction projects is presented in the following chapter.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Related studies conducted by other academics on risk management in building projects are included in this chapter. Different meanings of "risk" and "risk management" are provided in this chapter. Additionally discussed are risk assessment instruments, risk response strategies, and the risk management procedure.

2.1 Risk Definition

Various scholars have given different definitions of the word risk. Winch (2002) characterized it as a stage in which there is a shortage of information, but when the outcome is known and forecasted, it is easier to predict future events when taking into account prior experience. Risks are information gaps that are thought to pose a threat to a project. According to Smith (2006), a risk implies that it happens in situations when there is some information about the incident. "A situation in which an individual possesses some objective information about what the outcome might be" is another definition of it (Webb, 2017). Risks may affect a project in both positive and negative ways. Conversely, Cooper (2005) contends that a risk is exposure to the effects of uncertainty, whereas Darnall (2010) defines a risk as the potential for loss or harm.

2.2 Risk Management Definition

Williams et al. (2006) provide a thorough explanation of the idea of risk management and practical applications. It is unrealistic to think of risk management as a tool for future prediction (Hussein, 2019). Preston et al., (2015) contrasts this by describing it as a tool for facilitating a project so that better decisions may be made in light of the knowledge from the investment. This prevents decisions from being made based on incomplete information, improving overall performance. Although the authors' definitions of risk management vary in extent, the essential details remain the same. Cooper and Winsor (2015) provide a clear explanation of the essence of the notion of risk management based on several definitions found in the literature;

"The risk management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, identifying, analyzing, assessing, treating, monitoring and communicating risk". Figure 2.1 displays a process model for risk management.

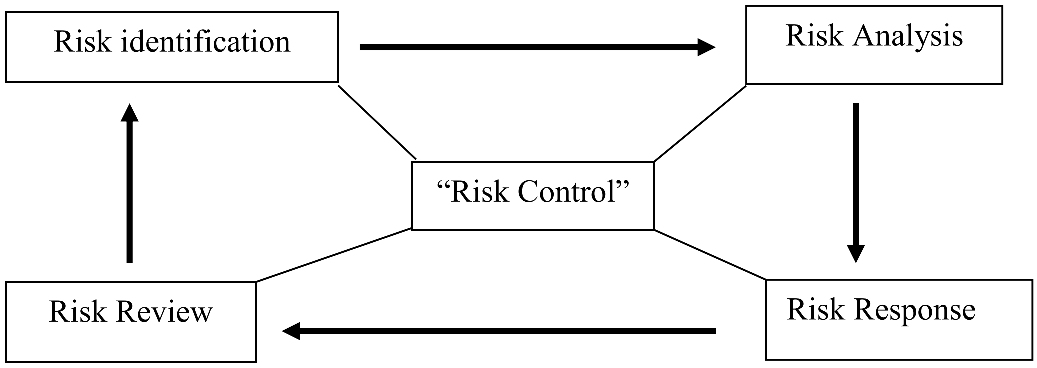


Figure 2.1: Process of managing risks

Source: Cooper and Winsor (2015)

An alternative definition of risk management is an organized approach to identifying areas of potential danger and carefully choosing how each should be handled. It is a management strategy that looks for sources of risk and uncertainty, evaluates their importance, and offers appropriate management solutions, according to Uher and Toakley (1999).

2.3 Global Situation of Risks on Construction Projects

Professionals and academics throughout the world have similar concerns about the health and safety of construction workers. According to research from the International Labour Organization (Podgórski, 2005; Lingard and Rowlinson, 2004; Nketekete et al., 2016), the construction sector is therefore considered to be the most dangerous place to work due to the high degree of health and safety concerns. The construction sector is believed to be accountable for a minimum of 60,000 severe incidents globally annually, which equates to one out of every six fatal work-related incidents.

According to statistics on occupational health and safety shown in a number of studies, building projects in the majority of nations have a far higher injury and death rate than other industries (Lingard & Rowlison, 2004; Nketekete et al., (2016); Hinze, 2008). According to Podgórski's (2005) research, construction is responsible for between 25 and 40 percent of occupational deaths worldwide. In the European Union (EU), the construction sector accounts for 30% of all workplace fatalities, although employing just 10% of the working population. According to fatality data, several nations show that although the construction industry accounts for 5% of employment and 20% of fatal accidents in the United States of

America (USA), in Japan it accounts for 30–40% of all industrial fatal accidents (Podgórski, 2005). Three to six times as many people are killed or seriously injured in construction accidents in underdeveloped nations (Jason, 2008).

This very high percentage of accidents on building projects is supported by other research carried out in poor nations (Sousa et al., 2012; Murie, 2007). Reporting incidents is difficult in poor nations, nevertheless (ILO, 2005). According to this point of view, health and safety concerns are a global issue that need a range of solutions. As a result, improving risk management in the construction industry remains a primary priority.

2.3.1 Global Construction Output Trend

The estimated value of building worldwide in 2022 was just over about USD 6.3 Trillion (United Nations Environemnt Programme, 2022)). The Engineering News Record estimates that in 2004, the construction industry generated yearly output worth 4.5 trillion US dollars. In addition, studies claim that, after growing by about 5% in 2006, the worldwide construction production raised by about 3% in 2007 to reach US$ 4.7 trillion 10%, or US$7.5 trillion, of the estimated $75 trillion global GDP was accounted for by the construction industry (Willis, et al., 2011)). The nominal Gross World Product (GWP), according to World Bank estimates, was around US$ 75.59 trillion in 2013. A 2011 WTO estimate claims that 7% of all workers are involved in the construction industry, which also contributes over one-tenth of global GDP. As a result, it was determined that the value of worldwide building production in 2013 was US$7.59 trillion. As a result, conducting a risk analysis is essential to ensuring effectiveness and efficiency in the building sector.

2.3.2 The Ugandan Scenario

Uganda is a developing country, as shown in Table 2.1 with a GDP growth rate of 4.7% in 2020 as opposed to 4.6% in 2019. The agriculture industry accounts for the largest portion of Uganda's GDP (24.6% in 2019 and 25.6% in 2020), which is primarily an agricultural nation.

Table 2.1: Scenario of GDP in Uganda

No.		2016	2017	2018	2019	2020
1	GDP overall	2,375,971	2,570,334	3,047,392	3,403,534	3,797,988
2	Rate of GDP Growth	2.7%	5.8%	4.4%	4.6%	4.7%
3	Output in construction (UGX Millions)	265,754.50	289,023.80	319,730.5	353,314.70	394,881.30
4	Expansion of the building industry	12.7%	4.50%	4.30%	4.80%	5.50%
5	Contribution of construction to GDP as a percentage	4.10%	4.20%	4.10%	4.20%	4.40%
6	At present prices, gross fixed capital formation (GFCF)	465,111	518,538	609,255	702,223	735,352
7	Construction and Structures	227,624	247,656	273,685	302,946	340,075
8	Contribution as a percentage to GFCF	48.90%	47.80%	44.90%	43.10%	46.20%
9	Consumption of cement in tons	2,671.20	3,104.80	3,870.90	3,991.20	4,266.50
10	Total number of people earning wages (000)	1,959.00	2,016.20	2,084.10	2,155.80	2,265.70
11	*Public sector*	73.00	81.40	88.80	98.70	112.0

	contribution from the construction industry (in '000 jobs)					
12	Jobs in the private sector: ‘000	19.50	18.70	17.30	17.40	18.30
13	“Total Contribution the construction Industry (000 jobs)”	92.50	100.10	106.1	116.10	130.3
14	“Contribution Ratio”	4.72%	4.96%	5.09%	5.39%	5.75%

Source: Economic Survey, (2021)

Table 2.1 further demonstrates that the building and construction sector grew by 5.5% in 2020 as opposed to the 4.8% growth seen in 2019. In 2020, the sector's share of the GDP climbed to 4.4% from 4.2% in 2019. The four years' largest record was set by this one. According to CBS (2021), this may have been caused by an increase in government spending on infrastructure development and improved construction activity in the private sector. Cement consumption, a critical indicator for the construction industry, grew from 3,937.30 to 4,226.50 metric tons by 6.9% in 2020. Commercial banks boosted their lending to the sector by 2.3% in 2020.

Spending on fixed assets (such as buildings, vehicles, and machinery) with the goal of increasing or decreasing the stock of fixed assets is known as gross fixed capital formation, or GFCF (Wibowo, 2009). The economy is a nation's primary concern, thus making fixed capital investments is akin to making an investment in its future. All firm investments in plant and equipment across all industries, as well as housing and infrastructure in the public and private sectors, are categorized as fixed assets. As per Wibowo's (2009) findings, the construction industry in developing countries contributes around one-third of all investments in physical assets for the economy, or between 40% and 60% of GFCF.

According to Table 2.1, the estimated gross fixed capital formation (GFCF) value increased nominally by 4.7% between 2012 and 2013, from UGX. 702.2 billion to UGX. 735.4 billion. Construction of buildings and structures currently accounts for more fixed capital creation than it did in 2009. From 47.8% in 2009, it grew to 48.9% in 2016. From 43.1% in 2012 to 46.2% in 2013, it rose. There are three different categories of employment, according to the Economic Survey (2014) “formal (Modern), informal, small-scale agriculture or subsistence farming, and pastoralist activities”. There were 5.8% more workers in the formal and informal sectors in 2013 than there were in 2012, when small-scale or subsistence agricultural and pastoralist activities are taken into consideration (12,782 vs. 13,524). As a result, the official sector accounted for 116.8 thousand of the 742.8 thousand new jobs created in 2013. An increase in building industry activity can be partially blamed for this increase in newly created jobs in the current sector.

The wholesale and retail trade, the motor vehicle and motorcycle maintenance industry, and construction, which increased by 13.5%, saw the highest increase in private sector employment in absolute terms in 2013. It is clear from the explanation above that the building industry is essential to any nation because of its contribution to social and economic development. Through backward and forward linking, it creates substantial employment and acts as a growth engine for other economic sectors.

2.4 Risk Factors Encountered by Contractors

This research sought to identify the potential key risks experienced by contractors and their influence on construction project delivery. Shen et al., 2022) ranked the eight key risks that she discovered after doing a literature research and surveying business professionals. In order to deal with these hazards, the study suggested risk management measures, and through individual interview surveys, confirmed their efficacy. Tam (2004) carried out a survey to investigate the components of inadequate construction safety management in China. The survey's findings revealed the primary factors influencing safety performance, which include: inadequate safety awareness among upper management, insufficient training, inadequate safety awareness among project managers, hesitancy to allocate resources towards safety, and careless operation. Other researchers looked at hazards or risk management in various project phases, whereas the aforementioned research focused on the various risks impacting the project objectives in terms of cost, time, and safety. The many risk categories that arise during building projects are shown in Table 2.2.

Table 2.2: Risk categories divided into groups

Risk categories	
Groups	Risks
Monetary	Financial
	Economical
	Investment
Political	Legal
	political
Environment	Environment
	Physical, Natural
Technical	Technical
Project	Client, Contractual
	Scheduling, Planning
	Design
	Quality
	Organizational
	Operational; Construction
	Project objectives
Human	Stakeholder, Labour
	Human Factors
	Cultural
	Market
Safety	Safety
	Crime, Security
Materials	Resources
	Logistics

Source: Ewelina and Mikaela, (2011)

In order to manage the above risks and many other risks effectively, many risk management tools have been suggested in literature to deal with risks. These have been discussed in the following sub sections.

2.5 Risk Management Tools in Construction Projects

There are numerous tools available to help with risk management program implementation. Additionally, a variety of tools are available to help with the management of projects, businesses, and system-of-systems hazards.

2.5.1 The Risk NAV Assessment Tool

The MITRE Corporation created Risk NAV, which has been thoroughly tested to help program managers manage risks and streamline the risk process. It allows for the collaborative gathering, analysis, prioritization, oversight, and visualization of risk information. Graphics are displayed for the three information risk dimensions of priority, likelihood, and status of mitigation. The US government created Risk Nav to record, examine, and present risks at a project or business level. The risk space is presented in tabular and graphical form, providing crucial details about each risk and enabling the risk space to be sorted and filtered to concentrate on the most crucial issues. Risk Nav uses a weighted average technique to provide each found risk an overall score. Weighing a risk's timeline (how soon it will appear), possibility that it will happen, and impact helps establish its priority (cost, schedule, technical). From most critical to least significant, this score ranks the dangers. Formally, this scoring system is founded on the idea of linear utility; greater values are assigned to risks that are more significant, and the gaps between the scores indicate how significant the differences are in comparison to one another.

2.5.2 The Matrix Risk Assessment Tool

The risk matrix assessment tool was created by MITRE Corporation to assist a client of MITRE in performing a risk assessment. The Baseline Risk Assessment Process was developed by MITRE and the customer as an expansion and improvement of the first procedure. Although the method and its applications were created with a particular client in mind, its principles can be used to acquire most government projects. Uganda does not frequently employ this.

Another method for evaluating risk in software-dependent systems that are interactively complex is the Mission Risk Diagnostic (MRD). It may be applied at any point in the life cycle of the system, including supply chain, operations, development, and acquisition. It gathers decision-making data by evaluating a set of systemic risk factors to give decision-makers a baseline of the system's present status. The discrepancy between a system's projected and actual states that emerges points to certain areas in which more funding is needed. The MRD may be implemented on behalf of the person or group in charge of system administration, or it may be applied by third parties.

It outlines the fundamental framework for carrying out mission risk analysis. The core MRD platform can be supplemented with optional analyses as necessary to evaluate mission risk in particular or specialized contexts. The MRD platform, for instance, can be enhanced with analysis modules to evaluate risk in system-of-system settings. A causal analysis can be added in a similar way to identify the underlying causes of mission risk.

2.5.3 Intelex Risk Management Tool

This tool makes it easier for a company to identify, analyze, monitor, review, and address both current and potential risks and hazards. To give a business a competitive edge in managing, mitigating, and preventing risks, it is matched with the standards for the ISO 31000 Risk Management standard. Because it may be exploited to serve the objectives of any organization, this tool is frequently utilized here in Uganda not only for building but also in the procurement process.

The aforementioned study makes it evident that, even if this research does not cover every tool available, implementing an effective risk management approach may help in identifying potential hazards and figuring out how to deal with them as a project moves forward. Owing to its growing importance, most businesses now view risk management as essential, and a number of strategies have been created to lessen the possible effects of hazards (Schuyler, 2001; Baker and Reid, 2005). According to multiple studies (Flanagan and Norman, 1993; Akintoye and MacLeod, 1997; Smith et al., 2006), the construction industry has a relatively high number of risks compared to other industries because of the unique characteristics of construction activities, which include long periods, complicated processes, an unpleasant environment, financial intensity, and dynamic organizational structures. Therefore, it is more crucial than ever to use efficient risk management approaches to mitigate risks connected with variable construction operations in order to finish a project effectively.

Previous studies have generally concentrated on the potential effects of risks on one area of project strategy, such as "safety" (Tam, 2004), "time" (Shen et al., 2016), or "cost" (Chen et al., 2004). Some studies have looked at risk management within the framework of a specific project phase, such the "construction phase" (Abdou, 1996), "design phase" (Chapman, 2001), or "feasibility phase" (Uher & Toakley, 1999), as opposed to looking at it from the perspective of a project life cycle. However, not much research has been done to examine risks from the viewpoint of project stakeholders, particularly contractors.

For the purposes of this investigation, a Risk Management Process (RMP) as outlined by Smith et al. (2006) was chosen. The four steps of the Risk Management Process (RMP)—Risk Identification, Risk Analysis, Risk Review, and Risk Response—and how to apply them to risk management are covered in more detail in this section. This page explains what this means:

2.6 Process for Managing Risk

2.6.1 Identification of Risk

According to Winch (2002), the RMP's initial stage is frequently informal and may be implemented in a number of ways based on the project team and the organization. It implies that in order to detect risks, future ventures should mostly depend on past experience. An allocation needs to be considered from the outset of planning in order to detect possible dangers in a project. Risk management entails preparing for unanticipated problems as well as prospective ones. Managing potential threats not only lowers project losses but also transforms risks into opportunities that yield financial success, environmental benefits, and other advantages (Winch, 2002). Making a list of potential risks that a project has to manage is the aim of risk identification (Hillson et al., 2004). By exposing possible problems, this attempts to bring the project team's attention to them.

2.6.2 Risk Analysis

The second step of the RMP, risk analysis, is examining the information obtained on potential dangers. It may be characterized as the process of identifying risks that will have the most impact on the project from among all threats mentioned during the identification phase (Cooper et al., 2005). Although some studies interpret the terms risk assessment and risk analysis as two independent processes, this component of the RMP will be consistent with the model described by Smith et al. (2006) and handled as a single process.

The approaches should be chosen in accordance with the project's scope, the risk category, and any related requirements or criteria. Whatever the approach, the intended result of such an examination should be trustworthy (Lichtenstein, 1996). The proper technique is frequently chosen based on prior experience, knowledge, and software options (Perry, 1986).

A variety of variables might affect the decision to use the best methodologies for the proper purpose in a risk assessment, according to Lichtenstein (1996). Every organisation can choose which of these elements is most important to them, then create the assessment in accordance with that decision. In a survey conducted by Lichtenstein (1996) “many factors were discovered, and the most important ones are listed below;

- Expense of employing the technique, including the method's own costs;
- The capacity to adjust to the needs of the organization;
- complexity, the method's degree of simplicity and limitation;
- completeness, the approach must be workable;
- Usability: The technique must be simple to apply and comprehend;
- validity: the outcomes have to be legitimate and
- Credibility

2.6.3 Risk Response

The action to be done in response to the risks and threats identified is examined in this third stage of the RMP. The chosen response strategy and approach depend on the kind of dangers involved (Winch, 2002). As one of the extra requirements, the parties engaged in this risk management process will also concur that a risk supervisor is necessary to supervise the development of the response (Hillson et al., 2004). As to Winch's (2002) findings, risk may be efficiently managed in proportion to its degree of influence. The four most popular risk-reduction techniques are avoidance, reduction, transfer, and retention, according to Manowong and Ogunlana (2010). Beyond those kinds of reactions, Winch (2002) notes that it is often hard to make a decision based on little knowledge.

2.6.4 Risk Monitoring

Because it collects and maintains all the data related to the identified risks, this RMP step is crucial. The ongoing monitoring provided by the risk management plan assists in the identification of new risks, the tracking of existing ones, and the elimination of hazards that have already been identified through the project and risk assessment (Hillson et al., 2004). It also implies that the primary objectives of monitoring and managing are keeping an eye out for threats and responding appropriately when needed. Techniques and tools for risk assessment and management consist of:

- Reevaluating risks in order to find new ones that might arise. Throughout the whole project, this procedure is continuously carried out.
- keeping an eye on the project's overall state to spot any changes that could have an impact or introduce new hazards.
- Status meetings to talk with the owner of the risk, exchange experiences, and assist in risk management.
- Updates to the risk register.

2.6.5 Qualitative Risk Analysis

According to Maria-Sanchez (2012) using techniques like quantitative risk analysis or risk response planning, qualitative risk analysis can help prioritize the risks that have been identified. It is believed that an organization's performance can be enhanced by handling risks with a high priority. Baloi (2012) asserts that the outcome of a risk analysis determines the best course of action to take. The possibility and impact of risk must be assessed using approved qualitative analytic approaches and tools before being considered in a qualitative risk analysis. According to Seymour & Hussein (2014), the following inputs are required for this process:

- risk-reduction strategy.
- hazards that have been identified—Risks found when identifying hazards.
- Project status refers to how far along a project is in its life cycle.
- Type of project: common or cutting-edge.
- Data precision: how well-known or understood the danger is.
- Impact and likelihood scale.
- Assumptions.

Risk impacts are the effects that a risk occurrence might have on the project's goals, whereas risk probability is the likelihood that a risk would materialise (Seymour & Hussein 2014). The methods and instruments used in this study include "risk likelihood and risk impact on project goals". The responses are translated into numerical numbers, which are then studied in order to enhance risk control and project execution between contractors in Uganda.

2.6.6 Risk Response in Planning

Risk response planning, according to PMI (2013), is the process of developing options and selecting a course of action to optimize opportunities and lessen threats to the project's goals. Maria-Sanchez (2012) states that it entails designating parties or persons to be in charge of each agreed-upon risk response and focuses on high-risk situations in qualitative and/or quantitative risk analysis. It ensures that every threat that necessitates a response has an observer, even though the actual risk management activity may be completed by a different party. This approach aims to ensure that all threats are properly addressed. According to Seymour and Hussein (2014) if risk response planning is effective, it will be simple to determine if project risk will increase or decrease.

Seymour and Hussein (2014) identifies the following inputs for this process: -

- risk-reduction strategy.
- Risks are listed in order of priority using a qualitative analysis.
- Project-specific risk rating.
- ranked inventory of calculated hazards.
- a list of possible answers.
- Risk thresholds: the amount of risk that an organization can tolerate.
- Stakeholders in the project who can take on the role of risk owners and have a shared cause are listed as risk owners.
- Typical risk causes: A single, general solution that might reduce two or more hazards.
- Trends in the quantitative and qualitative findings of risk analysis.

2.7 Tools and Techniques for Risk Response

Seymour and Hussein (2014) states that there are several risk mitigation strategies available, and the one with the best chance of success should be used. Any risk management plan should aim to maximize positive impacts while minimizing negative ones (Ghahramanzadeh, 2013). To implement the approach, precise actions are developed for each of the risks. Risk response may not always totally eliminate the intrinsic risk but instead leaves residual risk, which can be large, according to Sanchez, et al., (2009). The risk response strategy should give value for money and be proportionate to the risk (Sanchez, et al., 2009). The four risk response techniques listed in the Seymour and Hussein (2014) framework are “risk acceptance”, “risk transference”, “risk mitigation”, and “risk avoidance”.

2.7.1 Risk Avoidance

Changes to the project plan or specific project components, such as the project's scope, procurement strategy, supplier, or activity sequence, are necessary to avoid risks from negatively affecting the project's goals (Sanchez et al., 2009; Maria-Sanchez,2012). Some risks can be avoided, even though it is not always possible to totally eliminate all risk events (Seymour & Hussein, 2014). This risk management strategy should be used when there is a high possibility that a risk will occur and that it would have an adverse effect, which usually entails declining to engage in the activity (Panthi & Connell 2015). However, it stipulates that the risky components of the work's scope may also be left out. A project management plan can be modified, according to Mahendra et al. (2013), in order to remove a risk, shield project objectives from the effects of the risk, or reassess a project target that is in jeopardy by shortening the duration of the contract or narrowing its scope. Seymour and Hussein (2014) give several examples of avoidance techniques, such as limiting scope to avoid high-risk operations, dedicating more time or resources, going with a tried-and-true approach rather than an unorthodox one, and staying away from new subcontractors.

Risk avoidance might sometimes be improper due to a predisposition that many people have to have a risk-averse attitude. Other dangers may become more important as a result of ineffective risk avoidance (AS/NZS 4360, 1999). According to Seymour and Hussein (2014) many early-project risk occurrences can be managed by clarifying requirements, acquiring information, improving communication, or employing a specialist.

2.7.2 Transference

According to Shedden, et al., (2010) this entails sharing some of the risk with another party. It transfers ownership of a risk's management obligation and its implications to a third party (Seymour & Hussein, 2014). According to Panthi et al. (2007), risk transfer tactics are used even when the likelihood of an event occurring is relatively low when the risk impact is significant. According to Seymour and Hussein (2014), assigning blame for risk is the best strategy to control financial risks. There are essentially two ways to transfer project risks: either by obtaining insurance coverage for high impact hazards, or by shifting the risks to the customer, the contracting company, or other stakeholders through legal means. Risk transfer makes use of warranties, guarantees, insurance policies, and performance bonds (Seymour &

Hussein, 2014). According to Mahendra et al. (2013), the goal of risk transfer is to guarantee that the party best prepared to own and manage the risk does so.

2.7.3 Mitigation

According to Sanchez, et al., (2009), mitigation (reduction) refers to proactive measures taken to: i) lower the likelihood of the adverse event happening by implementing some controls; and (ii) lower the event's impact to a threshold that is tolerable should it occur. According to Panthi et al., (2007), risk avoidance and transfer cannot eliminate all risks. They point out that for the vast majority of hazards, risk mitigation techniques must be adopted. According to Seymour and Hussein (2014), it is more beneficial to prevent risk from occurring or decrease its effects on the project than to try and resolve the consequences after they have already occurred.

2.7.4 Acceptance

According to Shedden, et al., (2010), there may be residual risks that remain after hazards have been minimized or transferred, thus strategies should be made to handle the effects of these risks should they materialize, including figuring out how to finance them. After determining that it is more cost-effective to keep the risk rather than try a risk response action, a conscious and deliberate decision is made to do so (Sanchez, et al., 2009).

To make sure the threat is still controllable, it is crucial to monitor it. This approach is used, in accordance with Maria-Sanchez (2012), when a risk cannot be entirely removed or when the expense of a response in terms of time, money, or both is not justified by the magnitude of the risk. According to Seymour and Hussein (2014), the project team either elected not to alter the project plan to meet a risk or was unable to come up with a different appropriate response approach. They claim that the typical risk acceptance response technique entails making a contingency allowance using resources like time, money, or other resources to account for risks that have been identified. The effects of the assumed risks and the amount of allowed risk exposure should be used to compute this tolerance. A risk management tool must be able to suggest the optimal course of action for each risk and opportunity in order to manage them successfully (e.g., avoid, transfer, mitigate, retain) (Hillson, 2002).

Table 2.3: **Details of Software Tools for Risk Management**

Tool	Developer	Place of application	Which methods of risk analysis are employed?	Which risk management initiatives are encouraged
DRM	Advisory Services	Identification of risks at the stages of conceptual planning and bidding		Identification of risks
Forecast Risk Manager	Risky Choices	creating risk registers, integrating risk information with WBS, and using automated reminders for monitoring		Risk identification and monitoring
Risk Detector	Software Program Managers Networks	Identification and prioritization of risks	Risk rating	Identification and observation of risks
Choice Pro	Vanguard Software	establishing a project model in order to create scenarios	Monte Carlo Simulation, Decision Tree Analysis	Risk evaluation and analysis
Decide	discerning tools	Building project models and evaluating risks	Monte Carlo simulation	Risk evaluation and analysis

2.8 Summary of the Reviewed Literature

Construction projects in Uganda have continuously faced several risks without better empirical options for mitigation and reduction. Whereas contractor associated risks and their effects have been studied elsewhere. It is therefore imperative that a study that contextualises the risks associated with the contractors their effect on the projects and utilization of the risk management techniques is undertaken.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the methods used for the study. A detailed description is given of the study design, target and sample populations, sampling techniques, research instruments, data collecting tactics, and methods for data management and analysis.

3.1 Research Design

study designs come in a wide variety of forms, including experimental, comparative, historical, correlational, and descriptive study designs. Using a descriptive research methodology, the current study looked at risk management on construction projects in Uganda from the contractor's point of view. The risk variables were analyzed and assessed using questionnaires and surveys. Because the design allowed the researcher to reply to replies as they came in and was appropriate for the sort of research being undertaken, it was chosen. Interview guides, questionnaires, focus groups, documentary analysis, and respondents to specific building projects were used to gather data. Using questionnaires and interview summaries, quantitative data was collected from construction workers at specific construction projects.

3.2 Research Approach

In the study, both qualitative and quantitative research methods were applied. Systematic sampling and basic random selection were used to determine the research sample size. Simple random sampling was used since every firm in the population size had an equal chance of being selected for the study. But because systematic sampling is thought to be easy, common, and efficient, it was also used.

3.3 Study Area and Population

The study was conducted in four selected fully registered and licensed construction and engineering companies operating in Uganda, located in central and western region in Kampala and Masindi District. The registered and licensed construction or engineering companies were Prisma Uganda Ltd, Egiss Construction Ltd, Ambisius Construction Ltd and Rujab General Enterprise Ltd as indicated in Table 3.1. The researcher considered construction companies that were executing big projects under the ministry of Education and Sports which had a big challenge of stalled projects, terminated and others much extended beyond the normal expiry periods. Three of whom had running contracts awarded by central government and one was engaged in local government educational contracts.

Table 3.1: Sample Methodology Matrix

Organizational type	Target audience	Samples taken	Sampling Technique
Prisma Uganda Ltd	65	56	Random Sampling
Egiss Construction Ltd	50	44	Random Sampling
Ambisius Construction Ltd	40	36	Random Sampling
Rujab General Enterprise Ltd	50	44	Random Sampling
Total	**205**	**180**	

3.4 Sample Size Determination

Sampling is the process of selecting a sufficient number of elements from a population so that, after analyzing the sample and comprehending its properties, it would be feasible to generalize those qualities to the components of the population (Sekaran, 2013). Utilizing a known population and the Krejcie & Morgan (1970) table for sample size estimation, the results presented in Table 3.1 were acquired (Appendix II).

3.5 Sampling Techniques and Procedure

Random sampling was used to come up with different construction companies that had been in existence since 2015, working with buildings and the key personnel enlisted from the selected construction companies, expected to have knowledge on risks in construction projects in Uganda. Due to their experience in terms of years, employment, and offices held, it is thought that this targeted population had technical and specialized knowledge regarding the subject under inquiry.

3.6 Data Collection Methods

3.6.1 Questionnaire Survey Method

Data were gathered for the study using a questionnaire survey approach. The chosen businesses and specialists' replies were quantitatively gathered using the questionnaire. The variables in the conceptual framework were taken into consideration when developing the questionnaire, and questions addressing those variables were included. According to Amin, (2005), a closed-ended questionnaire that makes it simple to generate frequencies and percentages was the optimal method for gathering such data. The hazards related to carrying out construction projects and their impact on contractors in projects in Uganda were identified with the aid of a literature review and responses to key questionnaire questions.

3.7 Collection Tools for Data

3.7.1 Self-administrated Questionnaire

A questionnaire with closed-ended questions was used to collect data for the study. Closed-ended questions can speed up decision-making, make it simpler for the researcher to code the data for further analysis, and minimize error gaps in data analysis (Sekaran, 2013). Prior to asking about awareness of risks, types of risks encountered, sources of risks, and outcomes of risks, the surveys examined the backgrounds and positions of the respondents.

3.8 Research Instrument Validity and Reliability

3.8.1 Validity

Three experienced specialists were asked to appraise the usefulness of each item in providing information for the study. The questionnaire was developed with validity in mind. Then, using equation 3.1 number of items declared valid/number of items in the questionnaire, the content validity index, or CVI, was determined. Amin, (2005) believes that the obtained CVI of 0.90 is acceptable.

$$CVI = \frac{Number\ of\ valid\ items}{Number\ of\ total\ items\ in\ the\ questionnaire} \ldots\ldots\ldots\ldots\ldots (Equation\ 3.1)$$

3.8.2 Reliability

Fifteen participants who were not included in the final analysis took pre-tests. Computer data input and coding were employed by the researcher. The questionnaire's reliability was evaluated using Cronbach's alpha, and social science statistical techniques were employed to construct coefficients (IBM SPSS Statistics 21). The alpha coefficient, which typically ranges from 0 to 1, can be used to characterize the reliability of components gathered from multi-point structured surveys or scales and/or dichotomous (i.e., questions with two potential responses) inquiries. (For example, rating scales with a range of 1 to 5) For Table 3.2, the Cronbach's alpha reliability coefficient was 0.89, which was considered satisfactory (a suitable coefficient should be more than 0.70; Pak, 2008). As a result, because the data were reliable, the conclusions can be trusted.

Table 3.2: Reliability Statistics

"Cronbach's Alpha"	"Cronbach's Alpha Based on Standardized Items"	"No Items"
0.88	0.89	10

3.9 Research procedure

A letter of introduction from Kyambogo University was obtained and provided to the administrators at the construction company's offices and job locations. A self-administered questionnaire was used to conduct an independent survey of the aforementioned respondents. After data were gathered and evaluated, a report was produced and submitted to Kyambogo University for approval.

3.10 Analysis of Data

3.10.1 Quantitative Data Analysis

The data for this investigation were examined using the statistical program SPSS version 21.0. The primary metrics utilized to analyze the respondents' demographics were frequency counts and percentages; their views on risk management for construction projects in Uganda were evaluated using the central tendency mean and standard deviation. The respondents' background data was displayed as a bar chart showing their occupations and educational attainment, and as a pie chart showing their age, experience, and response rate. Means, standard deviations, and raking for project implementation frequencies, as well as percentages of awareness about construction implementation dangers. However, utilizing a regression analysis model equation from which model coefficients were derived, regression analysis was utilized to analyze risk management instruments.

3.10.2 Qualitative Data Analysis

Qualitative data were analyzed using content analysis. Key informant responses revealed recurring issues. The recurrent issues that emerged in regard to each of the guiding questions were shown using the data and a few direct statements from participants.

3.11 Measurement of Variables

Using scaled variables from a self-created questionnaire, information on the respondent's thoughts and opinions about risk management on building projects was gathered. In order to measure the variables, concepts had to be operationally defined. For instance, utilizing criteria suggested by Barker and Zabinsky (2010), the questionnaire was created to ask responses (Genchev et. al., 2011). To make it possible to create an index of the notion, they were filtered into quantifiable and observable components.

Measure - Based on the kind of data, SPSS set the default measurement scale for the variable. For instance, the standard measuring scale for variables of the numerical type in SPSS was a continuous or interval scale. For variables of type strin", the default scale was nominal. Ordinal, the third option, was intended for categorical variables with ordered categories but was not used by default. Because this affected the relevant statistical procedures, I generally gave each variable the maximum suitable measurement scale (scale > ordinal > nominal). The default setting could only be changed by choosing the right cell in the tenth column and an appropriate option from the drop-down list. The next chapter contains the findings' analysis and justifications.

3.12 Achievement of each specific objective

Objective One; To determine the risks associated with Ugandan contractors carrying out construction projects; respondents were requested to indicate the risks that they encountered in the previous five years during implementation of construction projects in their companies and to state how frequent these risks occurred.

Objective Two; to determine the effects of risks on contractors working on Ugandan construction projects; risk variables sought to have effects on implementation of construction projects were obtained through literature review and were presented to professionals to seek their opinion as to whether they agreed or disagreed with these variables. Statistical means were computed and the risk variables were ranked to determine those that had higher, medium and low effect on implementation of construction projects. The effects were measured on a scale using mean values as: higher effect (mean >4); medium effect (mean 3.00-3.90) and low effect (mean <3.00).

Objective Three; to develop a user-friendly contractor's risk management tool for construction projects in Uganda; the variables in specific objective two that had higher effects were subjected to regression analysis to understand the level of effect of each variable on implementation of projects. A regression model equation (tool) was obtained indicating model coefficients which measured the level of effect of each variable. It was determined that developing a tool that concentrates on minimizing the consequences (effects) will significantly support an alternative approach to risk management proposed by other scholars who have concentrated on risk identification, risk analysis, risk response, and risk monitoring This developed model will serve as a measuring device for construction projects by keeping track of the variables in the equation, where Y is the degree of impact by the various factors, so that a negative value denotes inadequate risk management and a positive value denotes better risk management.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter's presentation, analysis, and interpretation of the study's findings are based on the observations, interviews, and questionnaire. The rate of response and background information on the respondents are provided in the first section of the chapter on risk management in building projects in Uganda. The empirical findings are covered in the second part of the chapter.

4.2 Background information about the respondents

In order to ascertain the background of respondents, the study focused on profession, job title, education, and experience worked with a certain organization. The findings are detailed in the chapter's subsequent sections.

4.2.1 Response rate

The study had an 88.3% response rate since only 159 of the 180 questionnaires that were sent were returned and taken into account for analysis, as seen in Figure 4.1. This means that the research had a very high response rate, that a significant amount of data was gathered, and that the survey results were representative of the community that was polled, according to Amin (2005).

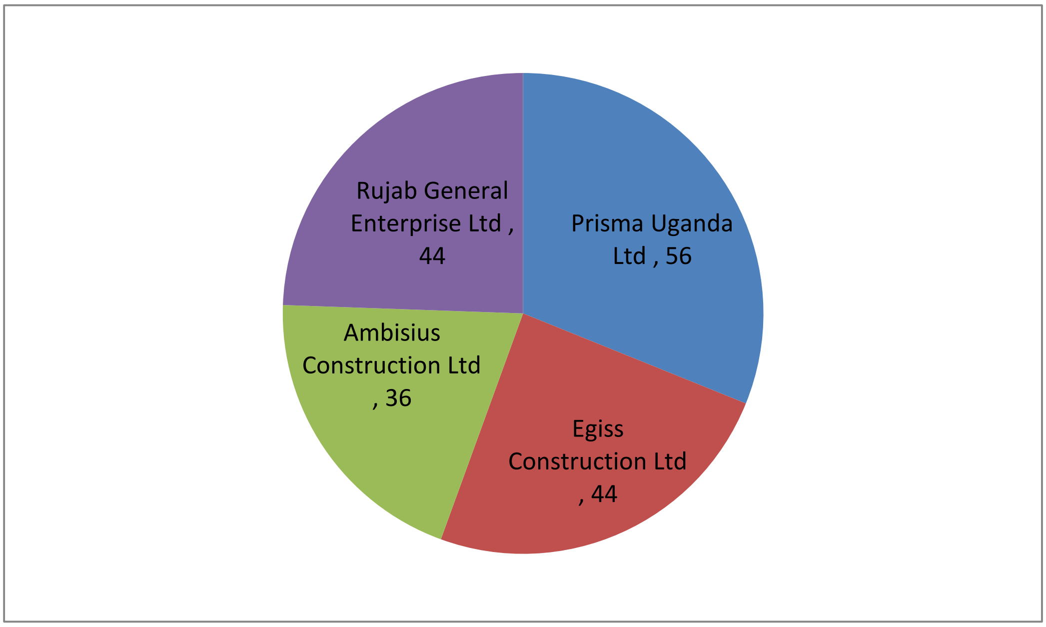


Figure 4.1 Response Rate

4.2.2 Professions of the Respondents

Respondents were requested to indicate their professions. This subsection presents the findings in this regard as indicated in Figure 4.2.

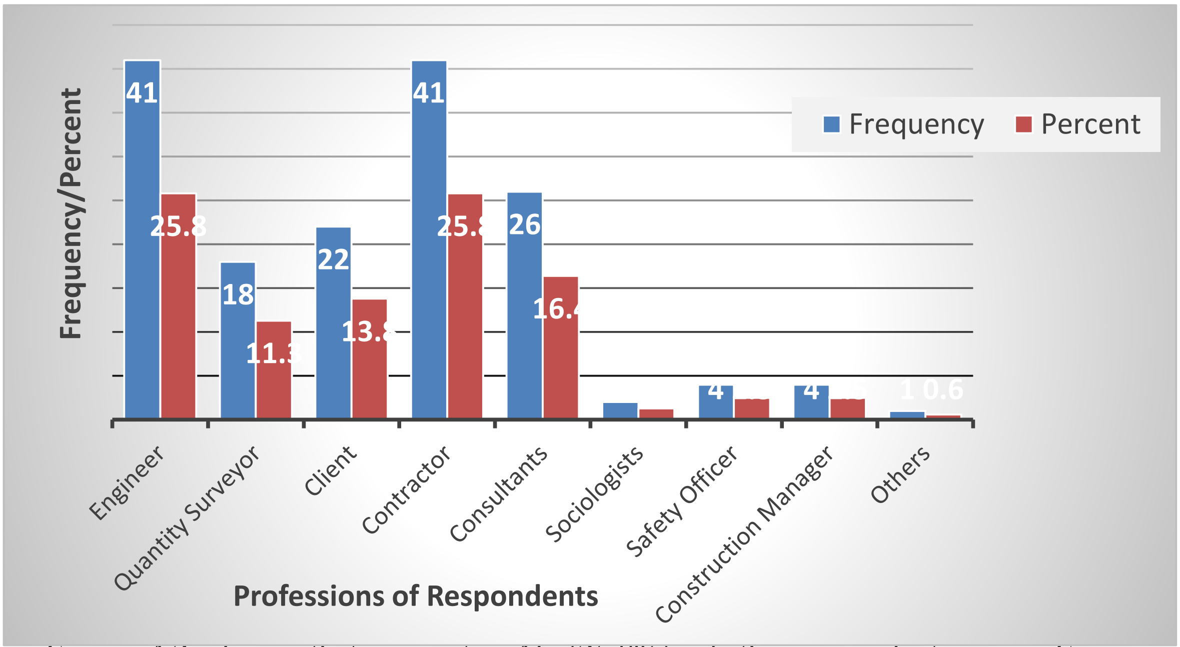


Figure 4.2 shows that majority, 41 (25.8%) of the respondents were Engineers and Contractors, 26 (16.4%) were Consultants, 22(13.8%) were clients, 18(11.3%) were Quantity Surveyors, 4(2.5%) were Safety Officers and Construction Managers, 2(1.3%) were sociologists and 1(0.6%) in the category of others was specified as security. This finding suggests that data were collected from a range of professionals believed to possess good knowledge of risk management and thus expected to generate reliable and dependable results and be able to draw reliable conclusions.

4.3.3 Level of Education of the Respondents

This section details the respondents' educational backgrounds and Figure 4.3 shows the results about levels of education of the respondents.

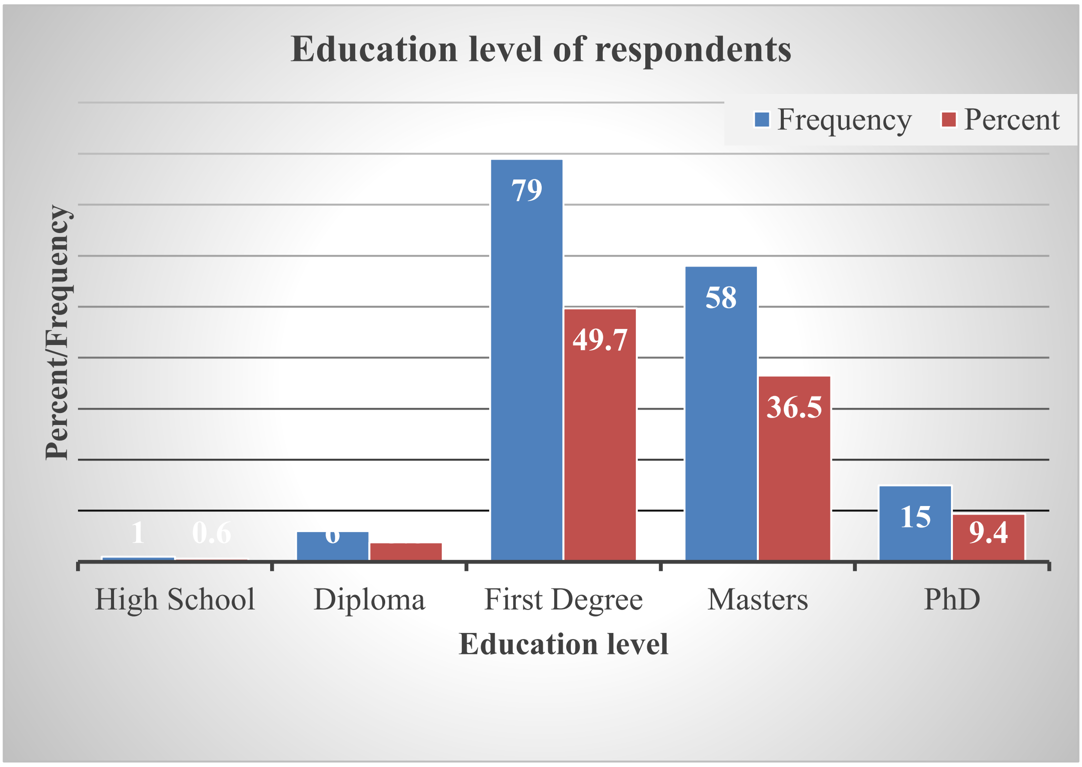
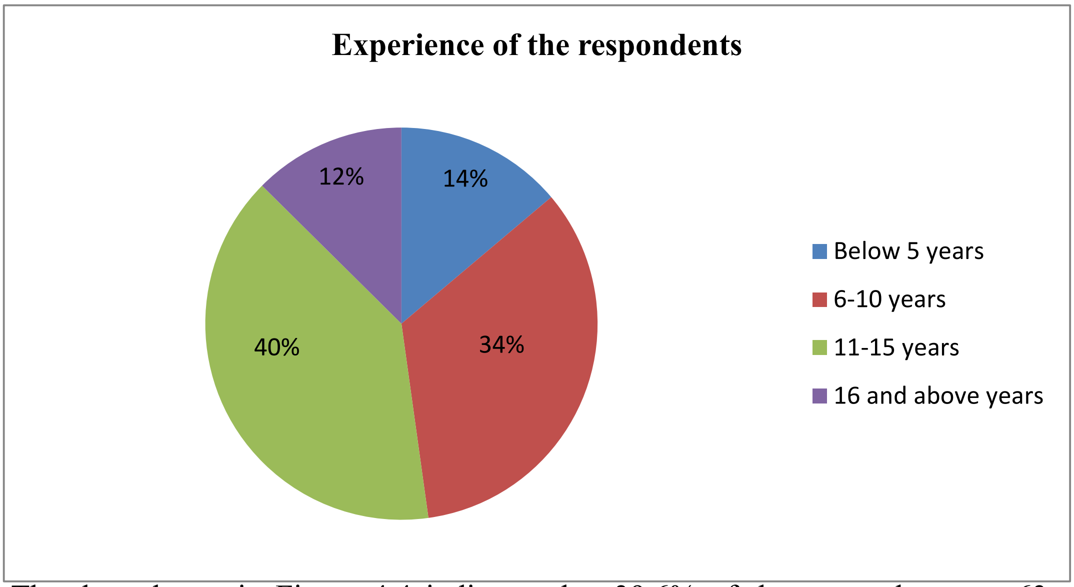


Figure 4.3: Education Level of the Respondents

Based on the data presented in Figure 4.3, the majority of respondents (79, or 50.7%) had completed their highest level of education, which was a bachelor's degree. This was followed by master's degrees (58, 36.5%), PhDs (15, 4%), diplomas (6, 3.8%), and advanced certificates (1, 0.6%). The study's conclusions indicate that the participants possessed an adequate degree of knowledge to comprehend and value matters pertaining to risk management, risks' consequences, origins, and frequency of occurrence in the construction sector. Because of this, it was thought that the data collected would produce trustworthy findings that would enable the drawing of important conclusions.

4.3.4 Experience of the respondents

This section lists the respondents' years of experience in the position during the time of interview, together with the results, which are shown in Figure 4.4.



The data shown in Figure 4.4 indicates that 39.6% of the respondents, or 63 people, had worked for 11 to 15 years, 34.0% for 6 to 10 years, 13.8% for less than 5 years, and 12.6% for more than 16 years. The fact that 86.2% of the respondents had been employed for longer than five years suggests that they had solid expertise in risk management. Because of this, it was thought that respondents with this degree of expertise would offer trustworthy information to generate conclusions that could be applied with confidence to the problem of risk management in construction firms.

4.3.5 Age of the respondents

This subsection presents the age of the respondents, at the time of the interview and the findings are presented in Figure 4. 1.

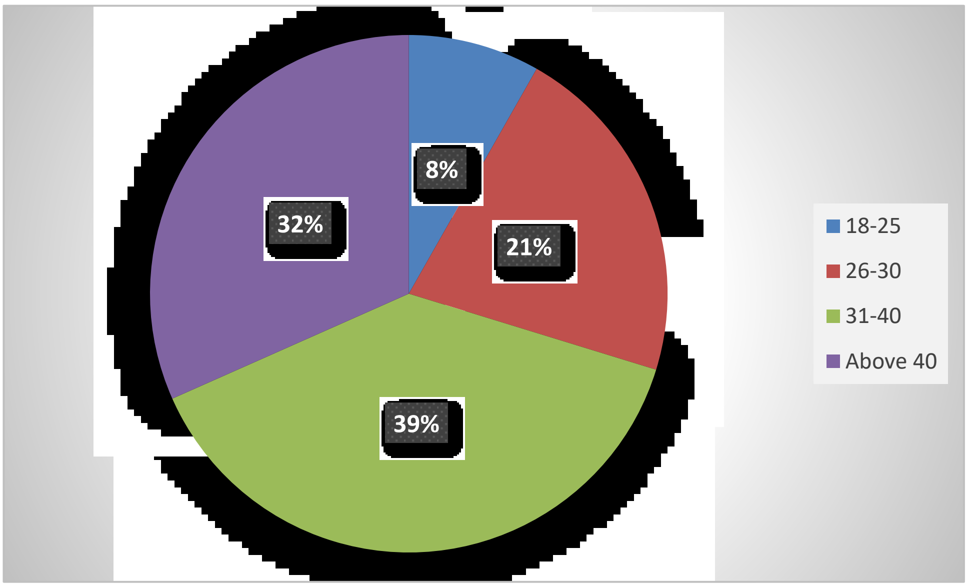


Figure 4.5 shows that majority, 61 (38.4%) of the respondents were of age between 31-40 years, 50 (31.4%) were of age above 40years, 34 (21.4%) were of age between 26-30 years while 13 (8.2%) were of age between 18-25years. This finding suggested that 91.3% of the respondents were above 25years of age and therefore could use experiences and maturity to make reliable decisions concerning risk management on construction projects in Uganda.

4.4 Empirical Findings

The goal of the study was to investigate risk management in Uganda's building construction projects. In order to establish this and give empirical support, quantifiable data were obtained through surveys, while qualitative data were generated through interviews. Three specific objectives were set in order to guide the investigation. The results from each objective were analyzed one after the other chronologically, with descriptive data, significances, and correlations offered to help interpret the findings. To help with the information triangulation process, findings from the interviews and reviews of relevant documents were conducted.

4.4.1 Knowledge on Risks Associated with Construction Projects Implementation

The study set three specific objectives as: identifying risks associated with the implementation of construction projects in Uganda, determining how risks affected contractors working on those projects, and developing an appropriate tool for contractor risk management. The success of the project in this study was dependent on the risk management plan. The information on the understanding of hazards connected with the execution of construction projects as shown in Table 4 is detailed in this subsection.

Table 4. 1: Knowledge on risks associated with the implementation of construction projects

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	149	93.7	93.7	93.7
No	10	6.3	6.3	100.0
Total	159	100.0	100.0	

Table 4.1 shows the extent of the knowledge by employees on the risks management on construction project in Uganda. The findings show that the respondents to a tune of 149 (93.7%) had heard about risks management and only 10 respondents at (6.3%) had no idea concerning risks management. This therefore means that the opinion presented by the

respondents in the data collected and analyzed is authentic and reliable. The level of knowledge regarding risk management in the construction industry is critical in decision making and planning further emphasizing the observations by Winch (2002); Smith et al., (2006) and Webb (2017). The responses that indicate that there is some considerable availability of this critical knowledge among the respondents would have helped in mitigating the risks associated with the construction projects in Uganda but the contrary seem to be prevailing.

4.4.2 Risks Associated with the Implementation of Construction Projects

The respondents were asked to enumerate any risks that the implementation of building projects in the research region had caused to their companies or specific projects over the preceding five years. Table 4.2 presents the results.

Table 4. 2: Risks associated with the implementation of construction projects

Risks	Frequency	Percent	True Percentage	Total Percentage
Accidents and injuries	24	15.1	15.1	15.1
Managing change orders	15	9.4	9.4	24.5
Unknown site conditions	25	15.7	15.7	40.3
Labor and resource shortages	22	13.8	13.8	54.1
Natural disasters (e.g. fire, wind, etc.)	7	4.4	4.4	58.5
Poor project management	24	15.1	15.1	73.6
Insolvency of contractor's surety	3	1.9	1.9	75.5
Defective design	7	4.4	4.4	79.9
Underestimation of cost	19	11.9	11.9	91.8
Negligence in inspection	13	8.2	8.2	100.0
Total	**159**	**100.0**	**100.0**	

Responses from the chosen professionals are presented in Table 4.2 regarding the dangers that their business or particular projects faced during the project construction phase. The data in Table 4.2 reveals that unknown site conditions ranked high with 25 (15.7%), Accidents and injuries ranked second with 24 (15.1%), followed by labor and resource shortages with

22 (13.8%), underestimating costs with 19 (11.9%), managing change orders with 15 (9.4%), negligence in inspection with 13 (8.2), natural disasters and defective designs with a tie at 7 (4.4), and insolvency of contractor's surety with 3(1.9%). With these results, it's possible to choose which risks to concentrate on as a project is being implemented. The results show that these risks exist and are known in the industry requiring attention to minimize them and improve the quality of work results in the construction projects. The continued neglect further affirms the findings of Lingard and Rowlison (2004).

4.4.3 Frequency of Risks Associated with the Implementation of Construction Projects

In this study, experts were asked to determine how frequently risks connected with the execution of building projects in Kampala, Uganda, occurred. Table 4.3 in this subsection presents these results.

Table 4.3: Frequency of risks associated with the implementation of construction projects

Risks	**N**	**Statistical Mean**	**Std. Deviation**	**Ranking**
Negligence in inspection	159	3.95	1.72031	1st
Labor and resource shortages	159	3.92	0.74245	2nd
Poor project management	159	3.62	0.83952	3rd
Unknown site conditions	159	3.57	0.77508	4th
Underestimation of cost	159	3.44	0.81591	5th
Defective design	159	3.40	0.78852	6th
Accidents and injuries	159	3.02	0.72454	7th
Managing change orders	159	1.72	0.75399	8th
Natural disasters (e.g fire, etc)	159	1.69	0.63400	9th
Insolvency of contractor's surety	159	1.62	0.71864	11th
Valid N (listwise)	159			

One of the risks that was highly ranked as the most frequent in the risks management of construction projects was Negligence in inspection with (Mean = 3.95 and St. Dev. = 1.72). The second highly ranked risk was labour and resource shortage (Mean = 3.92 and St. Dev =0.74). Furthermore, findings revealed that poor project management with (Mean = 3.62 and

St. Dev. = 0.84), unknown site conditions with (Mean = 3.57 and St. Dev. = 0.77), underestimation of cost with (Mean = 3.44 and St. Dev. = 0.81), defective design with (Mean = 3.40 and St. Dev. = 0.79), and accidents and injuries with (Mean = 3.95 and St. Dev. = 1.72) were significant risks with the mean well above 2.00. The risks managing change orders, natural disasters, and insolvency of contractor's surety had the mean below 2.00 and so were regarded as insignificant. As Jasen (2004) and Hinze (2008) had earlier observed that the risks associated with construction works in the developing countries could be greater is affirmed by these finding. The regulators and the professionals in the industry therefore have a duty to follow and adhere to the required practices to mitigate these hazards.

4.4.4 Sources of risks associated with the implementation of construction projects

In this study, experts were asked to weigh in by agreeing or disagreeing with the sources of risks listed in connection with the implementation of building projects in Kampala, Uganda. Results as shown in Table 4.4 are presented in this subsection.

Table 4.4: Sources of risks associated with the implementation of construction projects

Sources of Risks	**N**	**Arithmetic Mean**	**Std. Deviation**	**Ranking**
Construction Equipment	159	4.08	0.89	1st
Financing	159	3.75	0.95	2nd
Contract Specifications	159	3.45	0.99	3rd
Subcontracts and Supplies	159	3.27	0.85	4th
Project Scope	159	2.95	0.95	5th
Welfare and Logistics	159	2.81	0.96	6th
Contract Agreements	159	2.73	0.91	7th
Material Costs	159	2.58	0.89	8th
Project Designs	159	2.42	1.15	9th
Labour	159	2.09	0.75	11th
Site investigation and Takeover	159	1.82	0.98	12th
Permit Requirements	159	1.77	0.86	13th
Laws and Regulations	159	1.62	0.84	14th

Valid N (listwise)	159			

The findings revealed that construction equipment was one of the common sources of risks in the risks management of construction projects with (Mean = 4.08 and St. Dev. = 0.89). This is attributed to the industry looking for cheap labour as such ending up with employees who are not well trained. Another key reason was poor and or high cost of equipment maintenance that leaves many of the operationalized equipment prone to failure. The second highly ranked source was financing (Mean = 3.74 and St. Dev. =0.95). Furthermore, findings revealed that contract specifications with (Mean = 3.44 and St. Dev. = 0.98), subcontracts and supplies with (Mean = 3.27 and St. Dev. = 0.85), project scope with (Mean = 2.95 and St. Dev. = 0.95), welfare and logistics with (Mean = 2.80 and St. Dev. = 0.95), contract agreements with (Mean = 2.73 and St. Dev. = 0.91), material costs with (Mean = 2.58 and St. Dev. = 0.89), project designs, with (Mean = 2.41 and St. Dev. = 1.15) and labour with (Mean = 2.09 and St. Dev. = 0.75) in addition to the 1st and 2nd ranking, were significant sources of risks in risks management in construction projects while Site investigation and takeover, permit requirement, and Laws and regulations were regarded as insignificant sources with their means below 2.00. It is by no coincidence that most sources of the construction related risks are construction equipment further shows that there is still need to invest in meaningful morden equipment for the construction industry (Wibowo, 2009).

4.4.5 Effects Related to Risks Associated with the Implementation of Construction Projects

The variables indicated as consequences connected to risks associated with the implementation of building projects in Uganda were presented to professionals for agreement or disagreement in this study. Therefore, the results are presented in this subsection as shown in Table 4.5.

Table 4. 5: Effects related to risks associated with the implementation of construction projects

Effects related to risks	N	Statistical Mean	Std. Deviation	Effect
Project cost overruns	159	4.30	0.86	High

Schedule delays	159	4.28	0.84	High
Loss of the company image	159	4.26	0.77	High
Slow company growth	159	4.10	0.98	High
High labour turnover	159	4.06	0.86	High
Poor quality output	159	4.02	0.69	High
Frequent contract disputes	159	3.93	0.99	Medium
Frustrated company human resource	159	3.92	0.74	Medium
Low profit margins	159	3.35	0.98	Medium
Loss of self-esteem	159	2.98	0.94	Low
Infrastructure damage	159	2.63	1.04	Low
Limited capacity development	159	2.60	0.79	Low
stained employee-employer relationship	159	2.44	0.90	Low
Valid N (listwise)	159			

The above table indicates that there is a high effect related to risk associated with the implementation of construction projects, with means above (4.00); medium effect (mean value 3.00-3.90); low effect (mean <3.00). The results shown in Table 4.5 are consistent with Cooper's (2015) assertion that risk in the construction industry requires careful consideration due to the significant impacts linked to building projects. Mahendra et al. (2013) have seen risk as an exposure to loss alone, despite Leslie and Leslie (1995) having defined risk as an exposure to economic gain or loss resulting from participation in the building process. According to Seymour & Hussein (2014), risk in the context of construction is a variable whose volatility leads to uncertainty regarding the project's ultimate cost, time, and quality.

4.4.6 Development of Risks Management Tool in Construction Projects

A different approach to the effects related to the risks management in the construction project was to conduct regression analysis on the effects that were established as high, with a mean value above (4.00). Project Cost Overruns (PCO), Schedule Delays (SD), Loss of the company image (LoCI), slow company growth (SCG), High labour turnover (HLT), Poor quality output (PQO) were selected and subjected to regression analysis. It was determined that developing a tool that concentrates on minimizing the consequences will significantly support an alternative approach to risk management proposed by other scholars who have concentrated on risk identification, risk analysis, risk response, and risk monitoring. As a result, a regression model was obtained as seen in equation 4.1 and regression model coefficients are presented in Table 4.6.

$$Y = 20.690 - 0.055PCO + 0.106SD + 0.020LoCI + 0.136SCG + 0.120HLT - 0.102PQO$$

(equation 4.1).

This developed model will serve as a measuring tool for construction projects by keeping track of the variables in the equation, where Y is the level of risk management by the various factors, so that a negative value denotes inadequate risk management and a positive value denotes better risk management. The need for the construction risk management tool is important in the reduce their occurrence so that the quality of the construction of the industry in Uganda improves significantly as Schulyer,2001; Baker and Reid 2005 had suggested.

Table 4. 6: Model Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. P
		B	Std. Error	Beta		
1	(Constant)	20.690	.070		-.806	.001
	Project Cost Overrun (PCO)	-2.278	.155	.005	.055	.000
	Schedule Delay (SD)	-1.897	.165	.106	1.098	.000
	Loss of Company Image (LoCI)	-4.136	.161	.020	1.121	.000
	Slow Company Growth (SCG)	-2.197	.165	.136	1.194	.000
	High Labour Turn (HLT)	-1.336	.161	.120	1.222	.000
	Poor Quality Output (PQO)	0.761	.157	.102	1.153	.000
a. Dependent Variable: Effects related to risks associated with construction projects in Uganda						

The results show that Project Cost Overrun, Schedule Delay, Loss of Company Image, Slow Company Growth, High Labour Turn, and Poor-Quality Output were all significant effects related to risks associated with construction projects in Uganda. These effects can be seen in Table 4.6 indicated by model coefficients. Because the p values were significantly below 0.05, they were significant. As a result, a tool, such as equation 4.1, created from these effects will aid in identifying whether or not risk management is successful. If a risk management plan is employed and successful, then Y will show positive values. Tables 4.6, 4.7, and 4.8 reveal the findings of statistical analysis of variance (ANOVA) and the model's fitness as well as the impact of significant individual terms on the risk management of building projects.

Table 4. 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.884[a]	0.905	0.900	0.110510
a. Predictors: (Constant), PCO, SD, LOCI, SCG, HLT, PQO				
b. Dependent Variable: Effects related to risks associated with construction projects in Uganda				

The regression equation and coefficients of determination (R^2) were assessed in order to determine the model's fitness. The value of R^2 was determined to be 0.905, which suggests that a variation of 90.5% in risk management is attributed to the risk variables indicated in the model and are associated with implementation of building projects, and only 9.5% is contributed by other factors not explained by the model. The importance of the model is further supported by the fact that the value of the adjusted coefficient of determination (Adjusted R^2= 0.900) is also comparatively high" (Khuri and Cornell, 1987; Saqib et. al., 2012).

Table 4. 8: Analysis of effects associated with Risks Management in construction projects

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.216	6	1.652	408.477	.000[b]
	Residual	542.719	144	1.754		
	Total	550.935	150			
a. Dependent Variable: Effects related to risks associated with construction projects in Uganda						
b. Predictors: (Constant), PCO, SD, LOCI, SCG, HLT, PQO						

At a 95% level of confidence, the Fisher F-test (Fmodel=408.477) with a low probability value of (p=0.0001) demonstrates strong significance for the regression model. Any model term that has a p-value (probability of error) less than 0.05 is considered significant. The significance of the related model variable increases with decreasing p-value (Chen et. al., 2008). According to the ANOVA results, each of the six factors examined—PCO, SD, LOCI, SCG, HLT, and PQO—was found to be statistically significant, and as a result, has a sizable impact on the hazards related to building projects in Uganda. From the mathematical model developed (equation 4.1) it can be deduced that the effectiveness in monitoring the level of risks management in construction projects will largely depend on PQO, HLT, SD, SCG, PCO and LoCI respectively. As Winch (2002) observed the identification of the risk commences the process of the developing the effective model for risk management.

4.5 Applicability of Developed Tool in Risk Management

A regression model was obtained as seen in equation 4.1 and regression model coefficients were presented.

$$Y = 20.690 - 0.055PCO + 0.106SD + 0.020LoCI + 0.136SCG + 0.120HLT - 0.102PQO$$

(Equation 4.1)

This developed model will be used as a monitoring tool for construction projects by monitoring the variables in the equation. In the equation, Y is the level of impact by the different factors, when its value is negative it signifies poor management of risks and a positive means better management of risks.

Considering model coefficients in Table 4.6, the values of p were well below 0.05 and therefore significant. This means that the developed tool using the variables indicated, will be effective in risks management. The results of statistical analysis of variance (ANOVA) and fitness of the model as well as the effect of significant individual terms on performance of construction projects were obtained.

To test the fitness of the model, the regression equation and the coefficients of determination (R^2) were evaluated. It was determined that the value of R^2 was 0.905, meaning that a variation in risk management of 90.5% causes a high degree of impacts connected to risks associated with building projects indicated in the model, and only 9.5% is attributed by other factors not explained by the model. The value of the adjusted coefficient of determination (Adjusted R^2= 0.900) is also reasonably high which further supports the significance of the model" (Khuri and Cornell, 1987; Saqib et. al., 2012).

At 95% level of confidence, the Fisher F-test (Fmodel=408.477) with a low probability value of (p0.001) demonstrates strong significance for the regression model. Any model term that has a p-value (probability of error) less than 0.05 is considered significant. The smaller the p-value, the more significant is the corresponding model variable (Chen et. al., 2008). From the ANOVA results, all the six variables studied: PCO, SD, LOCI, SCG, HLT, PQO were found to be statistically significant terms and therefore have significant effects related to risks associated with construction projects in Uganda.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a review of the relevant risk management literature as well as an overview of the study's results, conclusions, and suggestions in relation to its research objectives. The conclusions of the study are summarized in the first section. Conclusions and recommendations follow, along with the study's shortcomings, contributions, and ideas for more research.

5.2 Conclusions of the study

The findings of the examination into risk management for construction projects in Uganda are presented in this subsection. The study concluded that there is knowledge regarding the sources, likelihood of occurrence, and associated impacts related to the various levels of risk management for building projects. Site conditions were deemed to be the primary risk involved in carrying out construction projects, followed by accidents and injuries, poor project management, labor and resource shortages, managing change orders, negligence in inspection, natural disasters and flawed designs, and insolvency of contractor's surety, in that order.

The study further concluded that Project Cost Overruns, Schedule Delays, Loss of the company image, Slow company growth, High labour turnover, Poor quality output, Frequent contract disputes, Frustrated company human resource, Low profit margins, Loss of self-esteem, Infrastructure damage, Limited capacity development, stained employee-employer relationship were all high level negative effects due to risks associated with construction projects in Uganda. This suggests that risk management on construction projects is important in reducing on effects. The level of effects encountered is an indicator of the effectiveness of the applied risk management approach. The regression model was:

$$Y = 20.690 - 0.055PCO + 0.106SD + 0.020LoCI + 0.136SCG + 0.120HLT - 0.102PQO$$

By tracking the consequences connected with risk management as variables in the equation, this established model is to be used as a monitoring tool for construction projects.

5.3 Study's recommendations

In this subsection, the study's recommendations for how to manage risk on building projects in Uganda are offered. It is necessary to conduct more study on the efficacy of the current risk management strategies at the stakeholder level and perhaps classify the sections according to each stakeholder participating in construction projects. This will help in advising on the expected effects resulting from the negligence or the lack of seriousness accorded by each stakeholder to the matter. Civil and Environmental engineering department should create a full course unit on Risks and Risks management in construction projects.

5.4 Research Limitations

The study's use of secondary data from a documentary review and primary data from observations, interviews, and a questionnaire on the opinions of a sample of specialists compromises the objectivity of the study's conclusions. The study also chose Masindi and Kampala as the case study location to represent Uganda, which may not have been the best choice. Nevertheless, the study's conclusions and suggestions are consistent with the stated goals and are based on the opinions of the chosen fields.

5.5 Study's Contributions

The study has assisted in highlighting the necessity of placing a focus on the execution of risks management. The developed measuring tool will be of use to contractors, consultants and clients in projecting the level of risks management in place by looking at the projected number of effects and as such be able to adjust accordingly. This will ultimately lead to continued improvement on the risks management approach thus being effective in construction project implementation.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Dear Respondent,

I'm a Master of Science student at Kyambogo University in Kampala, specializing in Construction Technology and Management. I'm researching risks management on construction projects in Uganda: a case study of the Kampala Metropolitan Area for my master's thesis at Kyambogo University. This form is meant to help the researcher collect information on the topic matter. Provided only for academic purposes, the information will be handled in the strictest confidentially. As an important responder, you have been selected for this study. To aid in the researcher's completion of the study, kindly complete the questionnaire. If this response reflects your viewpoint on the matter, kindly mark it.

I appreciate your participation in this effort.

Thank you,

Akunobere Jacob

SECTION A: Background Information (Please tick appropriately)

1. Gender of respondent: "
   a) Male ( )
   b) Female ( )
2. Your age bracket
   a) 18 – 25 years ( )
   b) 26– 30 years ( )
   c) 31 – 40 years ( )
   d) Over 40 years ( )"
3. Your designation in the organization
   a) Engineers ( )
   b) Quantity Surveyors ( )
   c) Clients ( )
   d) Contractors ( )
   e) Consultants ( )
   f) Sociologists ( )
   g) Safety Officer
   h) Construction Manager
   i) If other, please specify………………………

4. Level of education "

a) High school ( )
b) Diploma ( )
c) Degree ( )
d) Masters ( )
e) PhD ( )
f) Others (please specify) …………………………………………….....”

5. How many years have you worked on construction projects in Kampala - Uganda? “

a) Below 5 years ( )
b) 6-10 years ( )
c) 11-15 years ( )
d) 16 and above ( )”

SECTION B:

THE RISKS ASSOCIATED WITH THE IMPLEMENTATION OF CONSTRUCTION PROJECTS IN UGANDA

6. Have you ever heard of risks associated with the implementation of construction projects in Kampala - Uganda?

a) Yes ( )
b) No ( )

7. Which of the risks associated with the implementation of construction projects in Kampala - Uganda, has your company or project faced in the past five years?

a) Accidents and injuries ( )
b) Managing change orders ( )
c) Unknown site conditions ( )
d) Labor and resource shortages ( )
e) Natural disasters (e.g fire, floods, winds etc) ( )
f) Poor project management ( )
g) Insolvency of contractor’s surety ( )
h) Defective design ( )
i) Underestimation of cost ( )
j) Negligence in inspection ( )

8. Identify based on the given scale the rate of occurrence of risks associated with the implementation of construction projects in Kampala - Uganda?

Very frequent-5; Frequent -4; less frequent-3; rarely-2; never occurs-1 and let it be in table form as in (9)

Risks	Rate of occurrence				
	5	4	3	2	1
Accidents and injuries					
Managing change orders					
Unknown site conditions					
Labor and resource shortages					
Natural disasters (e.g fire, floods, winds etc)					
Poor project management					
Insolvency of contractor's surety					
Defective design					
Underestimation of cost					
Negligence in inspection					

9. State your level of agreement/disagreement on the sources of risks associated with the implementation of construction projects in Uganda. (Use the Scale: Strongly Agree – 5, Agree – 4, Neutral – 3, Disagree – 2, and Strongly Disagree – 1)

Sources of risks	Scale				
	5	4	3	2	1
Project scope					
Contract Agreements					
Material Costs					
Labour					
Construction equipment					
Subcontracts and Supplies					
Project Designs					
Site investigation and Takeover					
Financing					
Contract Specifications.					
Welfare and Logistics					
Permit Requirements					
Laws and regulations					

SECTION C:

THE EFFECT OF RISKS ON CONTRACTORS IN CONSTRUCTION PROJECTS IN UGANDA

10. Share your views on the level of agreement/disagreement with the variables listed as effects related to risks associated with construction projects in Uganda. "Use the scale to determine your level of agreement: Strongly Agree: 5, Agree: 4, Neutral: 3, Disagree: 2, and Strongly Disagree: 1".

Effects	Scale				
	5	4	3	2	1
High labour turnover					
Slow company growth					
Frequent contract disputes					
Infrastructure damage					
Project Cost Overruns					
Loss of the company image					
Schedule Delays					
Low profit margins					
stained employee-employer relationship					
Limited capacity development					
Frustrated company human resource					
Loss of self-esteem					
Poor quality output					

I appreciate your time. God Bless you.

Appendix II

TABLE USED FOR CHOOSING SAMPLE SIZE FROM A SPECIFIC POPULATION

N(ps)	S(ss)	N(ps)	S(ss)	N(ps)	S(ss)	N(ps)	S(ss)	N(ps)	S(ss)
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	215	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: ““N” represents population size”

““S” represents sample size”

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