RISK MANAGEMENT PRACTICES IN CONSTRUCTION PROJECTS OF SOMALI REGIONAL STATE, ETHIOPIA

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ABSTRACT

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The construction sector is complicated and risky; thus, practicing risk management processes became crucial for the success of the construction companies. This study examines how risk management is practiced in construction projects of Somali regional state in Ethiopia. It also identifies the most influential construction risk factors in the region which need to be given a higher consideration when practicing risk management principles. The literature review describes widely used risk management processes and techniques and shows the importance of risk management to the construction project's successful completion.

Questionnaires were distributed to different participants of 43 construction companies in the Somali region between October 2018 to January 2019. The collected data obtained from the participants were analyzed, and the results were presented in the form of bar charts or frequency tables. Based on the findings, there is a deficient practice of risk management in the Somali region's construction projects due to lack of knowledge or budget. Design errors and top management changes were found to have the highest probability of occurrence in construction project risks of the region. It is believed that this study is first of its kind about risk management practices of Somali region's construction projects.

Keywords: Risk, Risk management, Construction, Projects.

ÖZET

ETİYOPYA SOMALİ EYALETİNİN İNŞAAT PROJELERİNDE RİSK YÖNETİMİ UYGULAMALARI

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İnşaat sektörü oldukça karmaşık ve risklidir; bu nedenle, risk yönetimi süreçlerini uygulamak inşaat firmalarının başarısı için çok önemli hale gelmiştir. Bu çalışma, Etiyopya Somali Eyaleti'ndeki inşaat projelerinde risk yönetiminin nasıl uygulandığını incelemektedir. Ayrıca, risk yönetimi ilkeleri uygulanırken daha fazla dikkat edilmesi gereken Eyaletteki en etkili inşaat risk faktörlerini de belirlemektedir. Literatür taraması, yaygın olarak kullanılan risk yönetimi süreçlerini ve tekniklerini betimlemekte ve inşaat projesinin başarılı bir şekilde tamamlanması için risk yönetiminin önemini göstermektedir.

Somali Eyaleti'ndeki 43 inşaat şirketinin farklı katılımcılarına Ekim 2018 – Ocak 2019 tarihleri arasında anket uygulanmıştır. Katılımcılardan elde edilen veriler analiz edilmiş ve sonuçlar sütun grafikleri veya frekans tabloları şeklinde sunulmuştur. Elde edilen bulgulara dayanarak, Somali Eyaleti'ndeki inşaat projelerindeki bütçe ve bilgi eksikliğinden dolayı, eksik risk yönetimi uygulaması vardır. Bölgenin inşaat projelerinde meydana gelen en yüksek risk faktörlerinin tasarım hataları ve üst yönetim değişiklikleri olduğu tespit edilmiştir. Bu çalışma, Somali Eyaleti'nin inşaat projelerinin risk yönetimi uygulamaları konusunda yapılan ilk çalışmadır.

Anahtar Kelimeler: Risk, Risk yönetimi, İnşaat, Projeler.

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Last but not least, I must express my gratitude to my parents whose love are with me in whatever I pursue and my brother Abdi Hiis for providing me an endless encouragement and support throughout my years of study and writing this thesis in particular.

Omar Hiis UDAN

May 2019

24/05/2019

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stage of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

(Signature)

Omar Hiis UDAN

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LIST OF ABBREVIATIONS

BC	: Building Contractors
CA	: Consultancy Architects
CAE	: Consultancy Architects and Engineers
CE	: Consultancy Engineers
CSA	: Central Statistical Agency
EEA	: Ethiopian Economic Association
GC	: General Contractors
GDP	: Gross Domestic Product
HBC	: Highway and Bridge Consultancy
LFS	: Labor Force Survey
MAPFRE	: Mutualidad Agrupación Propietarios Fincas Rústicas de España *(Spanish insurance and financial institution)*
MoFED	: Ministry of Finance and Economic Development
PERT	: Program Evaluation and Review Technique
PMI	: Project Management Institute
RBS	: Risk Breakdown Structure
RC	: Road Contractors
RIBA	: Royal Institute of British Architects
RM	: Risk Management
SC	: Specialized Contractors
SRS	: Somali Regional State
SWOT	: Strength, Weakness Opportunities and Threats
UDCIB	: Urban Development Construction and Industry Bureau
WBS	: Work Breakdown Structure

1. INTRODUCTION

Risk management (RM) is a widely used concept in every industry. It helps to tackle the challenges posed by an uncertain world (Hillson, 2009) and assists to achieve project objectives (Mesfin, 2014).

The construction industry has various uncertain factors due to its construction complexity operations that require a formidable problem-solving capability (Dubois and Gadde, 2002). Therefore, decision making in terms of assumptions, expectation, estimates and project's future forecasts involve taking risks (Ahmed, Ahmad, and Saram, 1999).

Raz and Hillson (2005) claim that risk management evolved from different factors including the shift away from dangerous physical works, the role of technology, increasing competitive pressures and turbulence in the business environment. Besides, the ever-increasing complexity of business and projects, globalization trends, regulations, expanding views of organizations and the growing importance of projects are among the different factors evolving risk management (Raz and Hillson, 2005).

The construction industry has a significant contribution in every country's economy. The share of the construction sector in Ethiopia's total GDP averaged at about 5.2% in the period 2002/03 – 2006/07. The previous study conducted by Mesfin (2014) claims that Ethiopian construction projects are not mostly complete per the original plans. That means, projects face various changes and risks that lead to delays or cost overruns. Such risks may cause problems to the project objectives unless managed well. Therefore, the construction industry's better performance has linkages with the awareness and implementation of risk management practices (Chileshe and John Kikwasi, 2014).

In today's world, risk management practices are essential for construction firms to avoid any challenge posed by uncertainties in the projects. According to Lyons and Skitmore (2004), little study is available on the use of risk management practices in construction projects. Jung and Han (2017) claim that there is a gap between academia and practice of risk management. In other words, some firms know the risks and their consequences but do not have an established risk management method to approach risks (Gajewska and Ropel, 2011).

Practicing risk management techniques in construction project stages with experienced risk professionals or experts leads to achievement of project objectives. Therefore, this study

deals with construction risk management practices in the Somali Regional State (SRS) of Ethiopia by distributing a survey questionnaire to the parties working in construction projects.

This study not only gives clear scrutiny on construction projects' risk management practices in the region and its significant role in meeting project performance but also it collects some of the most active construction risk factors in the area. It is believed that this study is one of the pioneer studies about risk management practices of Ethiopia in general and Somali region in particular.

1.1. Research Questions

The fundamental core of this study focuses on the research questions which are:

- In what level of awareness do the evolving parties in SRS construction projects have about risk management principles?
- How do the stakeholders of construction projects in SRS practice risk management?
- What are the barriers to the implementation of Risk management techniques?
- Which risk management techniques are applied in SRS construction projects?
- What are the main risk factors occurring in SRS construction projects?
- How often do risk factors happen? Also, what impact do the risk factors have on construction projects?

1.2. Objectives of the Research

This study has both general and specific objectives derived from the research questions. The general aim of this research is to know the status quo of risk management in Somali Regional State's construction projects. The specific goals are:

- To test the level of awareness of different construction parties involved in Somali Regional State's construction projects about construction risk management principles.
- To determine the level of risk management technique uses in construction projects of Somali Regional State.
- To identify the barriers to risk management implementation in construction projects.

- To study the main risk factors to construction projects occurring in the Somali region.

1.3. Research Motivation

Two burning purposes drive the researcher to do this study. First, having a year of work experience with a construction project in the Somali Region, the researcher developed a strong desire to find a permanent solution for the construction risks that take place in the Somali region. The researcher witnessed different problems occurring in construction projects like delays, poor design errors, and limited project management in that year.

The second purpose behind selecting this topic is the researcher's standpoint that it will contribute something to the development of construction projects in the region. It may also help the researcher to do further studies and consultation on this area with the concerned companies in the near futurity.

1.4. Thesis Structure

The thesis is organized into six chapters as follows: Chapter 1 summarizes the main points of the research. It begins a general introduction to the study, research questions, objectives of the research and the research motivation. Chapter 2 indicates the current state of the Ethiopian construction industry and the Somali region in particular, it also adds the contribution of the construction industry in the economy of a country and lastly, defines the construction project's lifecycle phases.

The third chapter indicates literatures reviewed from professional journals, books, thesis, and internet searches. Clear cut definitions of risk, risk management, risk management processes, and risk management techniques are included in this chapter. Definitions of ten risk categories from 53 identified risk factors and the impact of risk on construction project phases are included in chapter three.

Chapter 4 shows the research methodologies and approaches employed to achieve the objectives of the study. It provides the data sources used, the method of data analyses employed and the limitations of the research.

Chapter 5 discusses the results obtained from the distributed questionnaire to the parties working in Somali regional state's construction projects. Finally, chapter 6 forwards conclusions and recommendations based on the study findings.

2. CONSTRUCTION INDUSTRY AND ITS LIFECYCLE

This chapter highlights the importance of construction industry in terms of its contribution to the economy, creating employment opportunities and enhancement of the stakeholders in developing countries especially Ethiopia. It also adds the types of companies working in Ethiopia's construction projects as well as the categorical grades of the overall companies in Somali regional state's construction projects. Lastly, this chapter defines the construction project's lifecycle phases.

2.1. Ethiopia's Construction Industry and Its Role in the Economy

The construction works in Ethiopia dates back to the 10th Century BC. Queen's palaces at foothills of Axum town. Axum obliques monument, Lalibela rock-hewn churches, Harar walls, and Gondar palaces are visible examples of Ethiopia's ancient construction (Desta, 2015). Ethiopia's modern buildings started during the reign of Emperor Menelik II (1866-1913) and developed in terms of regulatory at the time of Haile Selassie's reign (1930-1974) (Desta, 2015).

The construction industry has an essential contribution to the economy of every country, so do developing countries (Yimam, 2011). It also has a significant share in the total GDP of the country. The percentage of the construction sector in Ethiopia's Gross Domestic Product (GDP) averaged at about 5.2% in the period 2002/03 – 2006/07, which is a higher growth compared to the growth of the other periods because there had been increased investment in the development and expansion of various infrastructure projects (EEA, 2008).

The construction industry also plays a significant role in creating employment opportunities, especially in urban areas. It generates incomes in isolated communities and alleviates poverty (Ofori, 2012). The construction industry employs 20% of the total working force (Dinku, 2016). According to the 1999 Labor Force Survey (LFS), 0.9 percent was estimated to be in the Ethiopian construction industry out of 25 million employed persons in the country and increased to 1.4 percent in 2005 (EEA, 2008). That shows that a powerful construction industry in Ethiopia's regions can reduce the unemployment rate in the country more than any other sector.

The construction industry also opens many doors to different stakeholders who participate in the realization of construction projects. Between 2014 to 2015 a total number of 7259 contractors - containing building contractors (BC), road contractors (RC), general contractors (GC) and Specialized contractors (SC) - were registered by the Ministry of Urban Development and Construction (Zewdu, 2016). There are also more than 187 consulting firms in the Ethiopian construction industry (Mesfin, 2014) which are classified as Consultancy Architects (CA), Consultancy Architects and Engineers (CAE), Consultancy Highway and Bridge (HBC), Consultancy Engineers (CE) and Specialized Consultancy (SC). These contractors and consultants have varying grades due to the difference in their tendering limits and material requirements. General contractors (GC) from grade 1 to 10 can work in any construction projects rather than waterworks. Building contractors (BC) from grade 1 to 10 can work in any building construction. Road contractors (RC) from grade 1 to 10 can operate in road constructions, and Specialized contractors (SC) from grade 1 to 4 can work in any specialized area like painting. Besides all consultancies in Ethiopian construction industry are divided into six grades (grade 1 to 6).

Somali Regional State (SRS) is the second largest region in Ethiopia next to Oromia region. The accessible latest recorded estimation shows that its population is around 5.3 million (MoFED, 2015). The majority of its population (86%) live in rural areas (CSA, 2006). That shows construction industry is a small portion undertaken in the urban areas. SRS is a predominantly Pastoral region and has the lowest access for necessary facilities and construction projects compared to the other regions of Ethiopia (Argaw, 2017). Currently in SRS, the registered state-owned and private construction companies by Somali Regional State's Urban Development Construction and Industry Bureau (UDCIB) contain 296 contractors and 6 consultancies. Where only five contractors and one consultant company are grade one. The grades and classifications of these contractors and consultants are detailed in Table 2.1.

All the construction companies in Ethiopia face many challenges and problems to achieve the project objectives. Therefore, a top priority must be given the construction industry to improve its performance and to manage its negative impacts on developing countries like Ethiopia since it plays a significant role in economic growth. The leading root causes of construction industry problems in developing countries are the economic

weaknesses of these countries, government's inability to recognize the importance of the construction industry and the inherent underdevelopment of construction industries (Ofori, 2012).

Table 2.1. *Licensed construction companies in UDCIB*

Grade	GC	BC	RC	SC	CE	CAE
1	3	2	0	0	1	0
2	4	3	0	0	0	0
3	9	6	0	0	0	0
4	12	44	0	3	0	0
5	43	58	0		0	1
6	8	17	0		0	4
7	10	13	0			
8	16	24	1			
9	3	16	0			
10	0	0	0			
Total	108	183	1	3	1	5

2.2. Life Cycle of Construction Projects

Construction industry has a rapidly growing projects in size and complexity (Luo et al., 2017). Every project has activities which have beginning and an end, regardless of its domain (Gajewska and Ropel, 2011). Construction project activities are different from other business operations for that they are unique, have an adequate time scale, have an approved budget, have limited resources, involve an element of risk and achieve a beneficial change (Westland, 2006). Due to this, the construction project phases are not fixed, even the terminologies and stages of a project life cycle differ according to the different organizations and sectors. Therefore, providing one standard definition of a project life cycle is difficult.

The project life cycle has no universally accepted definition, and every project management guideline may use a separate terminology, dividing the life of a project into different phases (Hillson, 2009). Kartam (1996) divides the life cycle of a project into four stages, namely: conceptual and feasibility stage, design and engineering stage, construction stage, operation and maintenance stage. Smith, Merna and Jobling (2006) present eight stages of the project life cycle which are pre-feasibility, feasibility, design, contract/procurement,

implementation, commissioning, handover, and operation. Westland (2006) proposes initiation, planning, execution, and closure as a complete step by step project phases whereas Royal Institute of British Architects (RIBA, 2013) identifies the project stages as a strategic definition, preparation and brief, concept design, developing design, technical design, construction, handover/closeout and in use. Furthermore, Kumar and Harison (2016) present project phases as pre-project phase, planning and design phase, contractor selection phase, project preparation phase, project closeout and termination phase.

Chapman and Ward (2003) separate projects phases from project stages and classify project phases into four, and the later into eight stages. They classified project phases as conceptualization, planning, execution, and termination. Where, project stages are the conceive stage, design stage, plan stage, allocate stage, execute stage, deliver phase, review stage, support stage. Mehta, Scarborough and Armpriest (2009) categorize project life cycle phases as predesign phase, design phase, pre-construction (bid negotiation) phase, construction phase, and post-construction (project closeout) phase. Despite, a slight difference in language and numbering of project phases, the aim of all cases is the same (Smith, Merna and Jobling, 2006). Below are Mehta, Scarborough and Armpriest (2009) project phase definitions.

2.2.1. Predesign phase

Predesign or conceptualization phase is the initial point where the owner comes on to an idea in mind and gathers his team of experts then, collectively decide whether or not a project is feasible (Riddell, 2017). In this phase, the owner chooses the sort of project delivery system to be used, the type of contract to be used and the basis upon which the professional design will be paid (Chapman and Ward, 2003).

2.2.2. Design phase

This phase, the project is ready for contractor selection and deployment, and it is divided into three stages. First, is to define the project's objectives and consider the alternative ways, and the financial capabilities that can be attained to the project's objectives. Second, design specialists will prepare schematic diagrams showing the relationships among project

elements with detailed design of structural, electrical and other systems. Lastly, in the final stage, detailed project drawings, contract conditions, and documents with technical specifications are prepared (Bennett, 2003).

2.2.3. Preconstruction phase

During the preconstruction phase (also called bid negotiation phase or tendering phase) a construction team is assigned to the project often consisting a general contractor and some specialty subcontractors (Mehta, Scarborough, and Armpriest, 2009). There are four standard methods used in selecting a general contractor to suit the needs of the owner and uniqueness of the project. These are competitive bidding method, invitational bidding method, negotiated contract method and multiple prime contract method or fast-track project delivery (Mehta, Scarborough, and Armpriest, 2009). From these methods, a prime contractor (contractors) is selected, and the contract document is signed legally between the owner and the contractor.

2.2.4. Construction phase

The construction phase is the phase in which the project is executed practically. Therefore, all steps must be controlled per the contract document. The general contractor is required to inspect the work of all subcontractors, whether the work is done meets the standard of quality and artistry. Whereas, the architect observes and evaluates periodically to the contractor's work and notifies the owner if the work complies with that of the contract document (Mehta, Scarborough, and Armpriest, 2009).

2.2.5. Post construction phase

In the post-construction phase, the construction project is complete enough for the owner to occupy the facility. In this phase, the contractor requests the architect to confirm that the work is completed by conducting a substantial completion inspection (Mehta, Scarborough, and Armpriest, 2009). If the discovered incomplete items not included in the contractor's punch list are excessive, the architect may ask the contractor to complete those

unfinished items before rescheduling substantial completion inspection (Mehta, Scarborough, and Armpriest, 2009).

2.3. Summary

It has been reported in this chapter that the construction industry contributes greatly towards the growth and development of developing countries. The types of construction companies in Ethiopia and those companies in Somali region of Ethiopia, and their categorical grades has been mentioned. This chapter also defined the different phases in which every construction project activity goes from beginning to the end. In the following chapter, the literature review, risks on construction projects will be discussed. Thus, to make the construction industry in developing countries effective there must be a way to manage risks that hinder project objectives.

3. LITERATURE REVIEW

The following subsections highlight the previous researches conducted on risk management practices. Besides, they add definitions associated with the word risk, illustrate risk management processes, and present a classification of the most typical risks in Somali region's construction projects. Finally, the effects of risks on construction project phases are explained in this chapter.

3.1. Previous Researches

The increasing number of papers on RM show that risk management is very crucial in every aspect of life. The importance of risk management practices increases as the risks in construction projects increase (Sayegh, 2014). The purpose of risk management is to develop risk strategies which can reduce the risk's probability of occurrence and the negative impact of risks (Fan, Lin, and Sheu, 2008). To manage project risks, the emphasis has been on risk identification, assessment or analyses, mitigation or response and monitoring (Jung and Han, 2017). Many researchers studied critical risks on project successes and the ways in which these risks should be controlled, but there is a gap between academia and practice (Jung and Han, 2017).

Mishra and Mallik (2017) conducted a study to identify the impact of risk management practices on success of construction projects in Kathmandu, Nepal. They revealed that most (80%) of the housing developers are aware of risk management but some (65%) of the housing developers practice risk management in their projects, where only 45% of the developers were practicing in a formal way. In order to know the project risk management practices in UAE construction industry, a study was conducted through a distribution of a questionnaire to the international and local construction professionals in the UAE (Sayegh, 2014). Respondents have shown that they apply risk management processes especially risk identification and quantification processes. The respondents of this study agreed on the first three barriers to risk management implementation which are; understanding of the risk management techniques by the managers, finding suitable risk management methods and difficulty in assessing probability and obtaining estimates.

Visser and Joubert (2008) reported a study on risk management in terms of the formal risk culture, risk framework and risk practices for the South African construction industry. They found after analyzing the collected data, that construction companies have weak risk management practices, though risk management awareness was high to the construction project level.

Lyons and Skitmore (2004) studied the usage of risk management in Queensland engineering construction and compared to four studies conducted around the world. The results indicated that RM practice is moderate to high; RM usage in the construction and design phases of the project lifecycle is higher than in the predesign and post-construction phases. It also added that risk reduction was the most frequently used risk response strategy. In Kuwait a detailed study was conducted by Kartam and Kartam (2001) about construction risks based on the largest Kuwaiti contractors through distributing a questionnaire and guided interviews. Their result indicated that the Kuwaiti construction industry applies limited formal risk analyses techniques.

Limited studies exist on construction risk management practices in Ethiopia; Debela (2014) studied a thesis titled "the practice of construction risks management through insurance in the Ethiopian federal road projects". All the respondents in his survey have some knowledge on risk management but implementing RM process among respondents varied. It also indicated that, contracting parties provided insurance coverage to road projects to meet the demand of the client rather than to avoid possible risks. A research was conducted by Mesfin (2014) and investigated contract risk management practices in Ethiopian construction projects by developing a questionnaire and distributing randomly on different selected construction companies in Ethiopia mainly in Addis Ababa, the capital. The findings indicated that most of the parties in Ethiopian construction building projects have a concept on risk management but lack adequate knowledge on contract risk management processes.

3.2. Risk Definition

The word risk has several meanings to various kinds of literature and peoples. Individuals and organizations adopt attitudes toward risk that affect the way they make a

response about the word risk (PMI, 2013). Risk definitions vary based on probabilities, values, uncertainties and project objectives (Šotić and Rajić, 2015).

The risk is a multifaceted concept (Wang, Dulaimi, and Aguria, 2004) which is defined as “an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality” (PMI, 2013). The fact that the risk mostly has a negative impact has led individuals to consider the negative side of risk (Serpella et al., 2014). Positive and negative risks are referred to as opportunities and threats.

According to the literature reviewed, there are different definitions used by the researchers. Rosa (1998) defines risk as “a situation or event where something of human value (including humans themselves) has been put at stake and where the outcome is uncertain”. Campbell (2005) states that risk equals expected damage. Aven and Renn (2009) also make a definition near to that of Rosa (1998) and define risk as "uncertainty about and severity of outcomes or consequences of activity concerning something that humans' value".

As can be seen from the above definitions made by the researchers, most of them focused on the negative side associated with risks. Uncertain project losses or gains are conditions for riskiness. It seems strange but, when the knowledge of the exact benefits is unknown, the contractors may not give credit to an unknown gain (Al-Bahar and Crandall, 1990).

The terms uncertainty and risk seem similar, but there is a distinction between them. According to Knight (1921) risk arises from randomness with knowable probabilities, whereas uncertainty reflects randomness with unknowable probabilities. From here we can derive a connection between risk and uncertainty as Hillson (2004) refers: "the risk is the uncertainty measured, and uncertainty is a risk that cannot be measured". Raftery (1994) claims that “risk and uncertainty characterize situations where the actual outcome of a particular event or activity is likely to deviate from the estimate of forecast value”. As uncertainty increases, there is possibility or likelihood of an increase in the project budget, project duration, planning effort, number of activities in the planning network, design cycles, quality management effort, management attention and energy.

3.3. Risk Management Processes

Construction projects are prone to risks due to their increasing size and complexity. In today's global environment with dynamic changes, managing risk is very important (Liu, Low, and He, 2011). Risks need to be appropriately managed to complete a project on time within budget, and to ensure quality and safety expectations (Sayegh, 2014). The impact of risks on construction projects depends on the project's sensitivity to risks and the organization's ability to manage risks (Dikmen et al., 2018).

Cooper et al. (2005) define risk management as "the culture, process, and structures that are directed towards the effective management of potential opportunities and adverse effects". Risk management's aim is not to keep the risks out of projects but to constrain risks into an acceptable limit to the owner. In recent years risk management is a vital tool, and several documents have been published to provide instructions for risk management process practitioners (Wood and Ellis, 2003). A project to be successful, executing organization should address risk management consistently.

Risk management task enables individuals or organizations to make appropriate decisions on the uncertainties that surround them. Therefore, there is a need for a formal risk management process since eliminating all risks is impossible (Karimiazari et al., 2011). Many organizations use a document called the risk management plan which sets out all strategic requirements for risk assessment before the project starts (Lester, 2006). The risk management plan mainly has the following contents including general introduction, project description, types of risks, risk processes, tools and techniques, risk reports and attachments (Lester, 2006).

Most risk management commentators illustrate a risk management process containing identification, analyses, and response. Cooper et al. (2005) classify the risk management process as identifying, analyzing, assessing, treating, monitoring and communicating. This thesis considers the classifications of risk management processes from the widely referenced book for risk management, PMBOK guide (PMI, 2013), which are plan risk management, identify risks, perform qualitative analyses, perform quantitative analyses, plan risk responses and control risks. The below sections give a highlight to the risk management processes.

Risk management team first identify the influencing factor that negatively impacts a project's cost, time or quality. Then identified risk's magnitude is quantified and mitigating measures are implemented. The outcome of managing risks on a project is to reduce threats and capture more opportunities which do occur during the project's life cycle (Hillson, 2009). Identifying risk and effectively managing is the main aim of the risk process.

Risk management team identify risks and if possible, eliminate it from the project. If the risk is unavoidable, the unit reduces or minimizes risk effect on the project. The effectiveness of risk management mostly depends on the organization's experience (Mesfin, 2014). All in all, effective project risk management relies on looking backward to avoid past failures and looking forward to eliminating or minimizing future problems (Kendrick, 2015).

3.3.1. Plan risk management

The purpose of risk management planning is to make project managers ready and organize to eliminate or reduce adverse risks and enhance actual risks. Cautious risk management planning will result in successful project completion.

Most complex projects have a series of plans intended to guide the project and how it will be executed. Therefore, a risk management plan is recommended as a guiding document for the probable risks in the project. Pritchard (2015) claims that risk planning has not been developed in terms of content and format compared to other risk management processes, which results for project managers to establish risk preparing documents that suit their own project situation.

3.3.2. Identify risks

Risk identification is the first step which answers questions like what kind of risks may happen? How do risks may happen? Moreover, why do risks happen? In this process almost, all knowable risks are documented, bearing in mind the unknowable dangers that may occur during different phases of the construction project. Risk identification is said that it is the most important one in all risk management processes (Hillson, 2009).

There are different risk identification techniques used in this step. Hillson (2009) illustrates some techniques including brainstorming, checklists and timely lists, interviews,

and review of completed projects similar to the one in question. Lester (2006) adds that risk identification can be obtained using expert opinion, Delphi technique and work break down structure (WBS). After the end of this process, a list of risks which may negatively affect the project's activities is documented.

3.3.3. Perform qualitative analysis

Performing qualitative risk analysis is the process of assessing the identified risks with their probability of occurrence and impact. Effective assessment requires clear-cut identification and management of the dangers in the performing qualitative risk analysis process (PMI, 2013). This process is very important to determine high-priority risks which need treatment before the another (Keshk, Maarouf, and Annany, 2018). Performing qualitative analysis process evaluates the stability and consequence of the assumed risks (Pritchard, 2015).

The probability of risks is examined using experience, statistical data like historical charts and closeout reports. Risks are given a probability rating of Very High, High, Medium, Low or Very low, while some others use High, Medium or Low. The impact of risk on the project is examined by using, statistical data, past project histories, and expert opinions. Risks are given usually an impact matrix rated as Severe, Medium or Low. It can also be used Very High, High, Medium, Low or Very low (Lester, 2006).

Pritchard (2015) claims that the degree of risk in a given situation given by an analyst reflects the analyst’s personality. Dikmen et al. (2018) propose that risk ratings are affected by the attitudes of experts, especially when the level of risk in a country is high. Improbably occurring threats with minor consequences must be presented not a significant concern where both the probability of risk occurrence and its impact are very low. While risks occurring likely with high consequences is needed to be given a great consideration like the risks with high probability of occurrence and severe consequence.

3.3.4. Perform quantitative analysis

Performing quantitative risk analysis is the process in which identified risks affecting project objectives are numerically analyzed. This process supports the decision-making

ability to minimize project uncertainty by using quantitative risk information (PMI, 2013). The risks mainly impacting the project's objectives or given significant consideration in the performance of the qualitative process is analyzed in this process. In other words, perform quantitative risk analysis follows the perform qualitative risk analyses process (PMI, 2013).

Quantitative risk analysis process is rich with data and has the ability to mitigate risk's impacts compares to qualitative risk analysis (Keshk, Maarouf, and Annany, 2018). Project managers use different tools to augment those data like expert interviews, decision tree analyses, sensitivity analysis, simulations, expected monetary value, and program evaluation and review technique (PERT) (Pritchard, 2015).

3.3.5. Plan risk response

Risk response determines the action to be taken after the evaluation of risks in the identification, qualification and quantification processes. It is an essential element in the risk management process that generates what the organization will do with threats. Risk response planning also determines the organization's tolerance, project tolerance and the customer culture (Pritchard, 2015).

Construction risks can be either threat or opportunity to the project as mentioned in the previous sections. The response strategies for threats are avoidance, mitigation, transference/deflection and acceptance/retention (PMI, 2013).

The selection of one of these four risk response strategies depends on the severity of risk, resource availability and other factors relating to the project objectives (Zuo and Zhang, 2018). In practice risk response takes not enough consideration compared to risk identification or risk analysis (Zuo and Zhang, 2018). Because it lacks a followable standard process for project managers and it does not have a widely accepted response strategy to select for the projects (Fan, Lin, and Sheu, 2008).

3.3.5.1. Risk avoidance

As the name shows risk avoidance is the removal of risk's possibility that can influence the project objectives. Risk avoidance includes classically the options of eliminating the project or altering the approach to the work. Taking a lower risk option or an alternative

approach also represents a risk avoidance decision (Pritchard, 2015). Risk avoidance is adopted when a risk is very critical to the success of a project's activity execution or achievement of the project objectives (Zuo and Zhang, 2018).

3.3.5.2. Risk mitigation

Risk mitigation is any course of action that is taken to reduce the likelihood or consequence of risks. Pritchard (2015) claims that risk mitigation is the most common process of all risk response strategies. For risk mitigation project managers should make plans and take activities according to these plans. According to Partnerships Victoria (2001) "Mitigation practices vary depending on the risks being considered and whether the party concerned is a private or public one". Risk mitigation is adopted when a risk is critical to the achievement of the project objective (Zuo and Zhang, 2018).

3.3.5.3. Risk transference

Risk transference also known as risk deflection is the process to shift a consequence of risk or responsibility of a party to a third party like an insurer, subcontractor, vendor, partner, or a customer (Pritchard, 2015). Risk transference does not mean simply transferring risk to another party or person without his agreement, and it nearly always gives a risk premium payment to the party taking on the risk (PMI, 2013). Risk transference does not eliminate risk; instead, it creates an obligation for mitigation, acceptance or avoidance on to the shifted individual or party (Pritchard, 2015).

3.3.5.4. Risk acceptance

Risk acceptance, also known risk retention is the endurance of the risks either passively or actively. Passive risk acceptance is the acceptance of possible risks without any resolution or management. In passive acceptance, all real risks are documented and acknowledged by the management team. Active risk acceptance is the acceptance of possible risks with the development of contingency plans or fallback plans (Pritchard, 2015).

It is clear that managing risk costs a price. Avoiding it constricts the company's activities, and a potential opportunity may be missed out by the company. Reducing a risk

needs costly systems processes and controls, and transferring a risk also has a cost like an insurance premium. The best procedure for minor risks is to accept it (Blackman, 2015).

3.3.6. Risk monitoring and control

Risk monitoring and controlling come after risks are identified, assessed, and responses being developed. Risk monitoring and controlling put an action on the risk findings and implements a risk management plan (Pritchard, 2015). Putting solid risk plans into action and generating important documentation for the process are two challenges associated with monitoring and controlling. Lastly, identifying new risks, monitoring the identified risks, and managing risk responses are the main processes of risk management.

3.4. Risk Management Tools and Techniques

Risk management processes in construction projects were described in the section above and, some of the tools and techniques used in construction projects will be focused on in this section. Sayegh (2014) categorizes risk management tools and techniques into two groups, namely: identification tools, and assessment tools and techniques. Assessment tools and techniques can be subdivided into qualitative and quantitative tools and methods.

Checklist analyses, brainstorming, assumptions analyses, root cause identification, system or process flow charts, interviewing, SWOT analyses, cause and effect diagrams, influence diagrams, and Delphi technique are some of the identification tools and techniques. Most commonly used qualitative risk assessment tools include: engineering judgment, personal and corporate experience, percentage contingency from historical data, brainstorming and interviewing. In contrast, expected monetary value analyses, probability distributions, simulation, interviewing, decision tree analyses, and sensitivity analyses are some of the commonly used quantitative risk assessment tools and techniques. Project managers and other partners in construction projects use the most applicable risk management tool in a given project. As per the responses of the respondents in this study the most commonly used risk management techniques in Somali region's construction projects include documentation reviews, expert interviews, RBS, checklists, Event tree analyses, fault

tree analyses, sensitivity analyses. The usability and applicability of some risk management techniques are explained in the following paragraphs.

Documentation reviews include project plans, assumptions, previous project files, agreements and other information (PMI, 2013). Individuals having a level of understanding on documents specify whether the information in the documents have any potential risk which may be encountered on the project. This technique is applicable for all projects with complete initiating documents (Pritchard, 2015).

When using the interviewing technique, experts in construction are interviewed and questioned about the risks related to the projects in the areas of their expertise. This technique applies to all projects. It focuses on what risks exist and their severity. Interviews are used in risk management processes, but it is most useful in the risk identification process (Pritchard, 2015). This technique is also straightforward to be conducted because anyone can ask questions and jot down the response.

The RBS (risk breakdown structure) tool improves the understanding and recognition of risks logically. It composes of development and application stages. This technique is applicable when both sufficient risk and risk sources exist as well as when there is a significant project change. Using this technique requires software to generate the hierarchical diagram and experienced persons who differentiate and categorize the various risk sources (Pritchard, 2015).

Checklist technique is a risk identification tool in which the project manager builds early risk lists by using lessons learned from previous project risks. This technique is applicable in organizations using checklists in their projects. Using this technique requires only two participants who ensure that the list does not influence personal biases, the checklist(s) and output storing tool (Pritchard, 2015).

When using a planning meeting technique, all key stakeholders are brought together and focus on risk. The stakeholders decide the risk practices to be pursued and the practical approaches in seeking them. This technique is applicable for all projects and all processes but, it is most effective in initial risk planning stages (Pritchard, 2015). Planning meeting technique requires a panel of participants, which is a challenging task.

Delphi technique is a risk management technique used in the situation were people with experience are not available to be interviewed. This technique can draw information directly

from experts regardless of their busy schedules. Delphi technique is applicable when the project's experts cannot meet due to busy schedules or geographic distances between them (Pritchard, 2015). Using this technique needs both a skilled Delphi facilitator and experts to the field in question.

Brainstorming is a technique used for extracting information from participants. Therefore, many risk analysts choose this technique because of its broad acceptance and familiarity in a variety of risk management practices. It also encourages the free flow of information. All possible answers for the information gotten from the participants are drawn out and documented without evaluation. It is applicable in every step of the risk management process. Using this technique requires a facilitator, a group of participants and the physical facilities to document and assemble the outputs (Pritchard, 2015).

SWOT (Strengths, Weaknesses, Opportunities, and Threats) analyses technique is used to review risks and opportunities within the organizational context. This technique is applicable in the early stage of the projects as an overview analysis. Using this technique requires individuals with excellent knowledge of the project and the organization to be performed (Pritchard, 2015).

Sensitivity analyses are used to examine the influence of one single parameter alteration to the project in terms of risk context. This technique has both qualitative and quantitative assessment forms of an altered parameter. Sensitivity analyses are applicable when a significant project alteration is being considered. Resources for sensitivity analysis differ based on the type of evaluation used. If qualitative or subjective analyses is used authorities on the project and its future is required, whereas performing quantitative analyses requires supporting software to evaluate the change of a given parameter within the project (Pritchard, 2015).

Monte Carlo analyses technique considers the risks of cost and schedule of the entire project. This technique can also be used to assess the required level of funding or plan for successful project completion. Using this technique requires a software package (for example, Barbecana Full Monte, @Risk and @Risk for Excel) to make the repetitive computations of the analyses. This technique is applied when the probability that a project can be completed successfully is needed to know within a given funding and time frame. Using the Monte Carlo analyses technique is more expensive than conventional project

management tools. It also requires specialized personals to gather data and operate the instruments (Pritchard, 2015).

3.5. Risk Classification

There are several ways with different purposes for categorizing risk. However, counting all risks which might arise in construction projects is impossible (MAPFRE, 2012). The type of the project whether local or international takes a significant role in the typology of risk. Construction risks are broadly classified into external and internal risk (Sayegh, 2014). Internal risks are relevant to all projects (Wang, Dulaimi, and Aguria, 2004) and could be a risk to owners, designers, contractors, subcontractors, and suppliers (Sayegh, 2014). On the other hand, external risks originate from outside the project scope (Wang, Dulaimi, and Aguria, 2004) and can be economic, financial, political, social and cultural risks (Sayegh, 2014). For international projects, obvious danger such as uncertain political scenarios, uncertain procedural formalities, and unknown social conditions mostly occur (Wang, Dulaimi, and Aguria, 2004).

Jayasudha and Vidivelli (2016) classified risk factors into thirteen categories namely: technical risk, time risk, construction risk, design risk, legal risk, market risk, management risk, financial risk, policy and political risk, environmental risk, social risk, safety risk, and physical risk. Risks can be primarily categorized as human and natural risks (Edwards and Bowen, 1998). Natural risks are not humanmade ones and occur outside human agencies or systems, while human risks arise due to humanly organized systems. The subcategories of human risks include social, political, economic, financial, legal, health, managerial, technical and cultural risks.

Lam et al. (2007) identified five main risks, namely: capability risk, contractual and legal risk, economic risks, physical risk, and political and societal risks. Zhi (1995) classifies risks in terms of initial sources, national or regional level, construction industry, company level, and project level.

Although collecting risks in projects are not an easy task, in this study, 53 risk factors were identified from literatures reviewed (Mishra and Mallik 2017; Jung and Han 2017; Jayasudha and Vidivelli 2016; Mbachu and Taylor 2014; Marques and Berg 2011; Andi

2006; Hastak and Shaked 2000, Zhi 1995). The 53 risk factors were grouped into ten categories, namely:

- Managerial risks,
- Contractual risks,
- Financial and Economic risks,
- Technical risks,
- Material risks,
- Environmental risks,
- Social and Cultural risks,
- Political risks,
- Safety risks and,
- Legal risks.

Any risk could hurt project objectives regardless of its source (Sayegh, 2014). Therefore, managers must decide on the risks they want to bear and assess the risks they currently carry. They should also avoid, reduce or transfer to the risks they cannot take.

3.5.1. Managerial risks

Chen (2018) defines managerial risks as "the risks associated with the ineffective, destructive or underperforming management". In this thesis, risks associated with ineffective decisions and poor capabilities of the managers are listed in managerial risk category. The insufficient organizational management capability, top management changes and insufficient contract management capabilities are categorized as managerial risks.

3.5.2. Contractual risks

Contractual risks originate from the type of contract and procurement used for the project execution and operation. In this area, great observation and care are needed to protect the project from the likely risks. Every day changes in technology and tools used in construction affect the type of contract and delivery system. There is no single project delivery method appropriately used for any project (Ibbs et al., 2003), but due to the difference in the condition of the projects various kinds are used.

Project delivery method selection is one of the earliest steps in construction. Successful project delivery is the one in which projects are completed on schedule, cost and quality and safety expectations (Sayegh, 2014). Therefore, evolving parties in construction must forecast the type of risks in which any method could cause, and select the best one for their project objective.

3.5.3. Financial and economic risks

Financial risks are risks concerning project financing from predesign to post construction. Economic risks are from the microeconomic or macroeconomic impacts existing the location, region or country in which the project is being constructed. The economic and financial uncertainties may arise from a sharply decreasing local or national economy and fluctuations like interest rates, foreign currency exchange rates and rising tax rates (Zhi, 1995).

3.5.4. Technical risks

Technical risks are the risks reflecting "engineering difficulties and novelty", and it can be from the designs or the technologies used (Miller and Lessard, 2001). In this thesis, risk factors including insufficient engineering experts, insufficient site examinations, inadequate design, unavailability of skilled labors, insufficiently experienced staffs, incompetent project team, and lack of relevant training to the project are listed in technical inabilities of the construction parties.

3.5.5. Material risks

Material risks are risk issues involving the materials to be used in the project. Cheapest materials meeting the requirement of the specification and available at the nearest place of the project location are searched due to the enormous costs of projects in different countries (Jayasudha and Vidivelli, 2016). In this study, poor quality of construction materials, unavailability of materials needed for the project and unfavorable suppliers and sub-suppliers are identified as material risks.

3.5.6. Environmental risks

Environmental risks are risks concerning the environmental problems existing the location of the project (Jayasudha and Vidivelli, 2016). Weather and seasonal consequences, geology and soil type of the project site, unforeseen ground conditions, and floods can be taken as examples of environmental risks on construction projects.

3.5.7. Social and cultural risks

Social and cultural risks are risks arising from language barriers, inconsistency cultural differences, bribery and corruption acts, insecurity and crime pestilence, religious differences, diseases as well as informal relationships (Zhi, 1995). Construction workers from different cultural backgrounds revealed different behaviors and actions leading to severe accidents on site. Schwab (2017) claims that poor work ethic in the national labor force is one of the leading and most problematic factors for doing business. Managing cultural differences successfully gives the organization a competitive advantage while, failure for managing cultural differences could cause severe problems to the organization like a decrease in construction productivity (Kivrak et al., 2009).

3.5.8. Political risks

Political risk is "highly subjective and business specific event" (Ashley and Bonner, 1987). Therefore, it can be defined in different ways by both academicians and decision makers. Connick et al. (2012) define political risks as "the probability of disruption of the operations of companies arising from acts of governments and political institutions as well as minority groups or separatist movements."

Political risk is concerned local, regional or national politics confronting the project. The most sensitive political risks are civil disorders, wars and continuous changes in government policies. Political risk effects negatively on international companies than the local ones in a country. Ashley and Bonner (1987) claim that many experts on this field have an opinion that the "probability of encountering political risks abroad is directly proportional to the relative stability of the host country's political system."

3.5.9. Safety risks

Working at full sites, operating at very tall heights and the use of heavy machines in construction industry sometimes bring losses to individuals, organizations, and societies as a whole (Zou and Zhang, 2009). Therefore, construction safety has an increasing interest in the construction industry to reduce the large-scale disasters and accidents caused by routine tasks (Ali, 2006).

In this research, safety risks are included to the ones rising from the safety standards used throughout the project lifecycle, Trips and falls, fire and electricity in construction projects.

3.5.10. Legal risks

Legal risks are the ones that emerge from the potential losses caused by regulatory or legal actions (Spacey, 2015). It mostly arises from the prospect that contracts may not be enforced. In this study, legitimate use on land and property, legal disputes among different parties, breach of contracts, incorrect confirmations of contract documents, customs and import restrictions and procedures, constraints of employment and material availabilities, complex planning approval and permit procedures are added to the activities in which legal risk can arise during construction projects.

3.6. Effects of Risk on Project Phases

Every project has some successive phases and subphases whereas each phase has a particular purpose, and after its completion, there is a decision to review a pending action. Project activities need to be assessed well because, the riskier the activity is, the costlier its consequences will be if the wrong decision is made (Jayasudha and Vidivelli, 2016).

Risk assessment is the critical feature of the decision in each phase to proceed to the succeeding stage of the project (Smith, Merna, and Jobling, 2006). A project to be fully effective, risk management must be addressed to the whole project phases. A preliminary risk analysis should be performed before each stage, and further risk analyses should be addressed with increasing precision and details throughout the project management process (Chapman and Ward, 2003).

On long duration projects spanning several months or years, a regular risk assessment must be carried out. In the beginning, the possible risk management options of a project are broad and then, go to a narrower range of issue from stage to the next (Smith, Merna, and Jobling, 2006). The advisability of risk management increases as the interdependency between projects increases (Chapman and Ward, 2003).

In the project planning phase, a risk plan should be established to mitigate risks before the construction phase. The risk management process is closed out when the project is executed entirely (Westland, 2006). In the predesign phase which affects the type of contract and procurement, risk management must be argued enough with high strategic decisions (Wood and Ellis, 2003). The earliest phases of the project are related to value control to ameliorate the project objectives; the design stage is associated with value engineering to get the required functions at minimum cost whereas the construction phase is concerned with quality management to assure that the design is constructed accurately with no costly rework (Smith, Merna, and Jobling, 2006).

3.7. Summary

Risk, a word which has different definitions to different works of literature, occurs in every industry. The construction industry is riskier than others due to its uniqueness and ever-increasing complexity. Thus, risk management is inevitable to enable construction firms to make appropriate decisions on the uncertainties that surround them. Project managers should follow steps of risk management processes to control challenges posed by risks in the projects.

A widely used risk management processes are plan risk management, identify risks, perform qualitative analysis, perform quantitative analysis, plan risk responses and then control risks. Every process in risk management has varied suitable techniques.

Construction projects of SRS also face different risks which hinder to reach the project objectives. In this study, 53 risk factors were identified and broadly categorized into ten risk types. The following chapters will illustrate how these risk processes and techniques in the literature review are practiced in the Somali region's construction sector.

4. RESEARCH METHODOLOGY

According to the research problem mentioned in chapter one, the conceptual frameworks and literature reviews presented in subsequent chapters, this chapter presents research methodologies adopted in this study. It presents the methods employed for data collection and data analyses.

4.1. Questionnaire Design

At the beginning of the questionnaire distribution, explanations to the question forms were given to the respondents, that helped respondents to get a good view of risk management process techniques and practices.

The questionnaire had five parts. The first and second parts were about the general profiles of the companies and that of the participants respectively. The third part was about knowledge on risk management of the respondents and how they learned it. The fourth part contained questions on risk management practices by asking respondents whether their company practices risk management or not. The last part consisted of potential risk factors in construction projects for evaluation. A wide range of literatures were the source of major risks in construction projects. Then, a consultation was conducted with the experts of Somali region construction companies to verify the risk list. After that a verified 53 risk factors were added to this questionnaire and the respondents were requested to evaluate the probability of occurrence of the identified risks and their impact on construction projects by using 1-5 Likert scale. Where '1' is assigned to a risk that has the lowest probability of occurrence or impact on the construction projects, and '5' is located to a risk having the highest impact or greatest possibility of incidents. The last part was intended to identify the most probable or impactful risks of Somali region's construction projects.

The questionnaire sections in this study shown in the appendix with modifications of research conducted by Mesfin (2014) contains both close-ended and open-ended questions. The main aim of the close-ended questions was to save the time of respondents by selecting the most appropriate choice from multiple-choice questions. Open-ended questions were used in areas having large responses (i.e., areas in which all its possible answers were unpredictable). However, no respondent answered the open-ended questions.

4.2. Data Collection

The research data was collected using primary sources through the distribution of a descriptive survey to the contractors, consultants, and clients working in construction projects of SRS. The Somali region was in transition period at the time of the survey, were most of the construction works stopped, some of the companies bankrupted and others needed to renew their license. Therefore, only 43 firms including both private firms and state-owned construction enterprises were available. Most of these available firms (34) were contractors, six of them were consultancies and three were clients.

The main important bodies relating to this study in the contractor companies were general managers, deputy managers, office engineers, project managers and site engineers. For general and deputy managers of contractor companies only those having an engineering based formal knowledge were chosen. Because of this only eight general managers who had an engineering related formal knowledge, were sent the questionnaire. All the office engineers of contractor firms were sent the questionnaire. Besides, 12 contractor companies were executing active construction projects at the time of the survey, therefore, the project managers and site engineers of these 12 contractor companies were sent the questionnaire. In short, the total questionnaires sent to the contractors were 66.

All general managers, deputy managers and office engineers in the three client firms were sent the questionnaire. the total questionnaires sent to the clients were 9. For consultant companies, general managers, deputy managers, quantity surveyors, residential engineers and construction engineers were sent the questionnaire. Therefore, the total questionnaires sent to the six consultancies were 30.

The overall questionnaires distributed to those 43 companies containing clients, contractors, and consultants working in Somali regional state's construction projects from October 2018 to January 2019 were 105 questionnaires. Due to the reluctance of some of the construction professionals to participate in this survey, only 63 out of the 105 questionnaires were returned. Of those 63 responses eight of them were rejected because they were incomplete or improperly responded. Due to this, only 55 responses were used to assess the risk management practices in Somali regional state as shown in Table 4.1. Generally, in the

construction industry poor response rates are issues that limit the intention to get enough representatives from the sample frames.

The 55 respondents with valid responses in the survey were working different types of construction companies in which 3 were client, 23 were contractors and 6 were consultants. As can be seen in Table 4.1, twelve of the 23 contractor companies in this survey were general contractors (GC), one of them was road contractor (RC) and the remaining ten companies were building contractors (BC). One of the 6 consultant companies was consultancy engineering (CE), and the other five companies were consultancy architects and engineers (CAE).

Table 4.1. *Distribution of questionnaires*

Company type	Number of companies	Total questionnaires sent	Respondents' companies	Number of respondents with valid responses
Client	3	9	3	6
Contractor	34	66	23	34
Consultant	6	30	6	15
Total	43	105	32	55

4.3. Data Analysis Method

Descriptive statistics were employed to analyze the responses collected from the participants by applying a statistical data analysis tool particularly SPSS. Frequency technique was used to figure out how money responses fit into a particular category, and the percentage values of each answer were presented either using bar charts or tables. The percent axes show the percentage of respondents while the other axes are cited to the subjects they relate. Besides, all percentages do not add up to 100%, since the respondents could make multiple responses in one question.

A Likert scale of 1-5, which is the most widely used scale in survey researches was used to identify the degree of risk's impacts and its probability of occurrences. The respondents were requested to determine the relative likelihood and impact of each threat to the construction projects. Then, the level of impact and occurrence probabilities were analyzed according to their mean values. In addition to that, all risk factors were ranked

according to their mean values. The mean scores and risk rankings were presented in forms of tables. Lastly, a T-test was performed to identify that the risks have the same impact on construction projects in terms of time, cost and quality.

4.4. Research Limitation

This study is not enough for a concrete solution, due to the reluctance of some of the stakeholders to give a response to the survey questions and unavailability of written literature about the Somali regional state's construction projects and risk management. Although this study is limited, it can increase the risk preparedness on construction projects for concerned parties, and it may contribute to reducing the risks occurring in the Somali region's construction projects.

5. RESULTS AND DISCUSSIONS

5.1. Demographic Profile of Companies and Respondents

Based on the analyses, 49.1% of the companies were working in residential projects, 29.1% were executing in infrastructure, 12.7% in commercial projects and the remaining 9.1% focused on health/ welfare related projects (Figure 5.1). As mentioned in the literature, there are different types of grades in the Ethiopian construction industry. Therefore, all contractors and consultancies in the survey had a specific grade of 1 to 8. Clients do not need to have a particular class. As can be observed from Figure 5.2 most of the respondent's companies (24%) were Grade 1. Grade 2 and Grade 5 were 14% each. Grade 3 and Grade 4 were 17% each. Grade 6 and Grade 8 were 3% each, while the remaining 7% of the companies were Grade 7, this shows that most of the companies in the survey can do different construction projects as they have the highest grade (Grade 1) to implement any project.

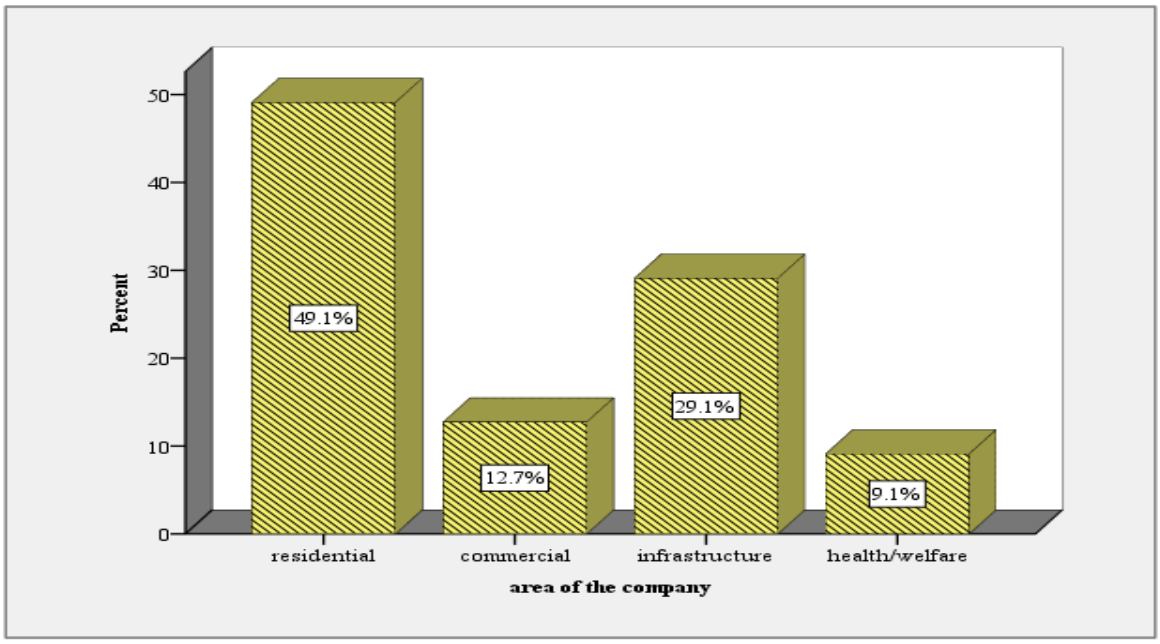


Figure 5.1. *Area of work of the company*

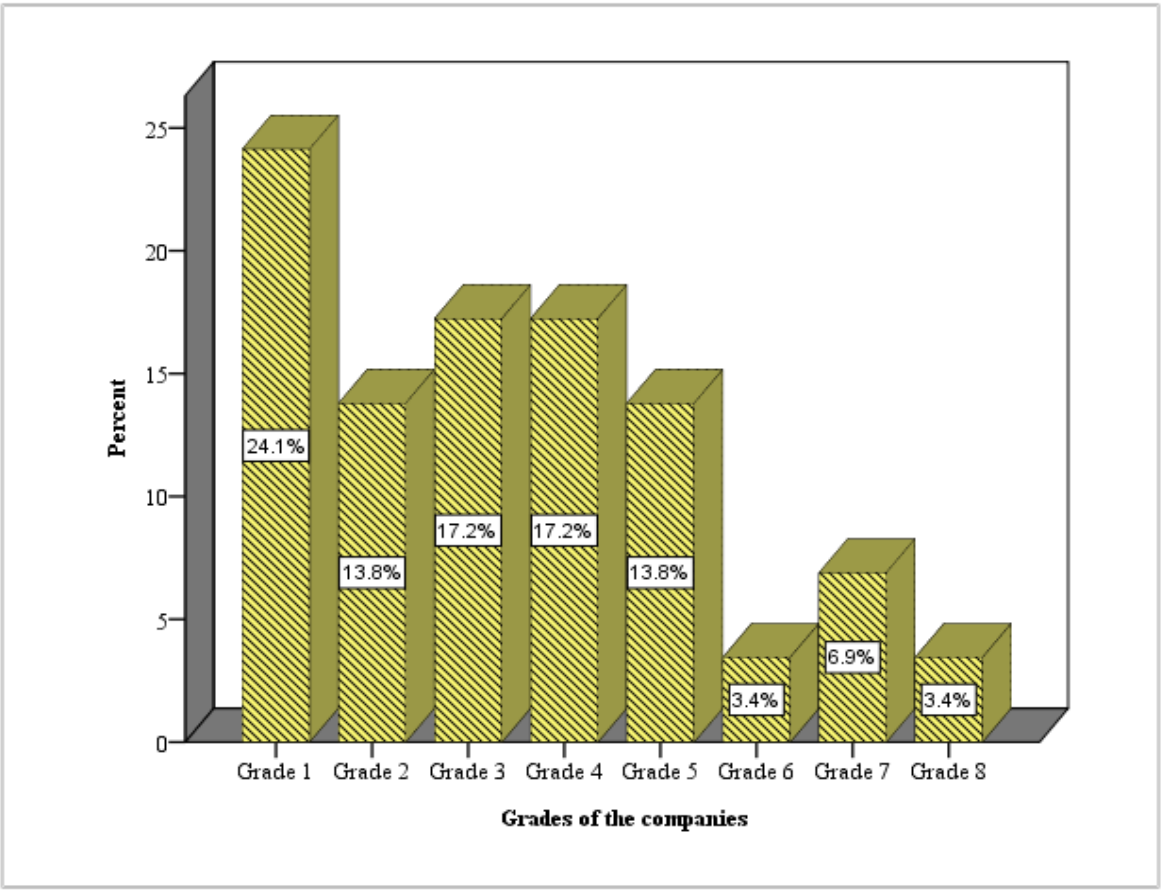


Figure 5.2. *Grades of the companies*

Most of the respondents' companies (50%) had an age of 6-15 years in the construction industry as shown in Figure 5.3. Companies having 11-20 years of age were 34.4% while only 6.3% had an age of 21-30 years, and the remaining 9.4% of companies had an age of 0-5 years. The companies (6.3%) having 21-30 years of age were working nationally in Ethiopia where all other remaining companies were working only in the Somali region.

Besides, BSc holders constituted a significant portion (78%) of participants while 22% had an MSc level as shown in Figure 5.4. This demonstrates that most of the respondents do not have specialization in any field in the construction industry.

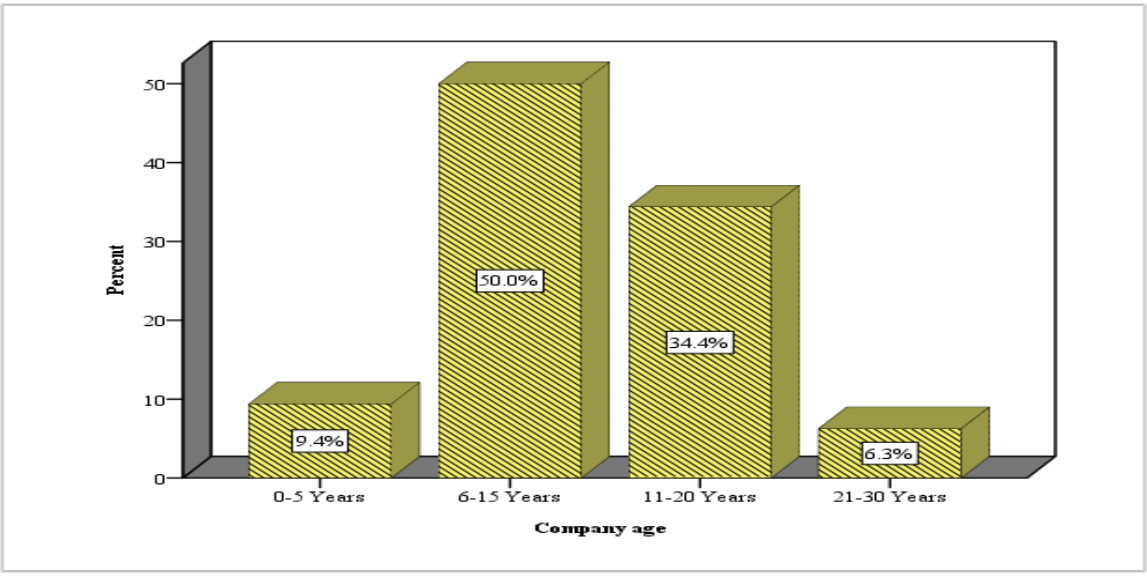


Figure 5.3. *Company's age in years*

Figure 5.4. *Respondents' level of formal education*

In terms of participants' experience, 73% of them had an experience of 0-5 years in the construction industry, 22% had 6-10 years of experience, and the remaining 5% had an experience of 11-20 years (Figure 5.5).

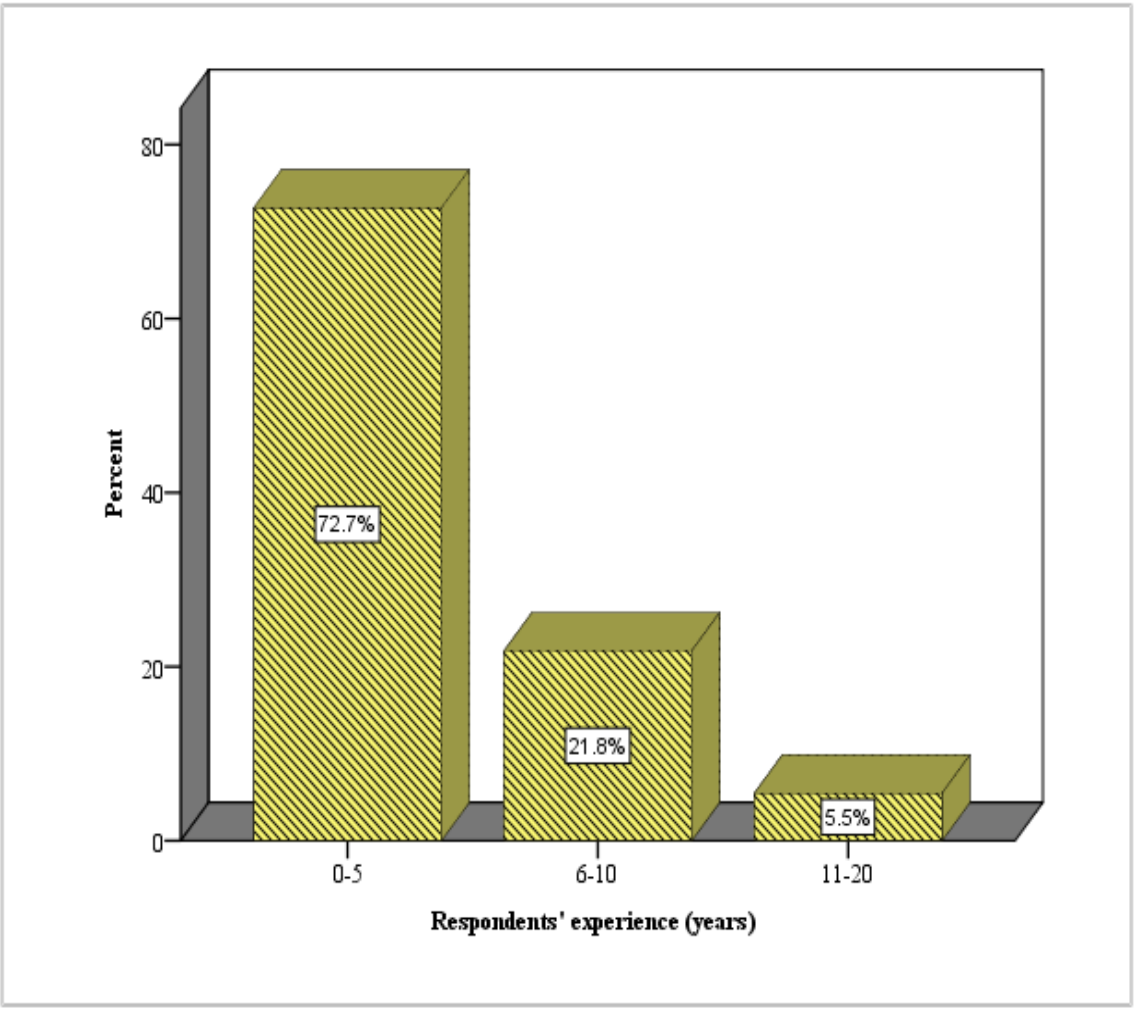


Figure 5.5. *Respondents' experience*

According to Figure 5.6, 40% of the respondents were office engineers. General managers, project managers, and site engineers were 16% each. Deputy managers and quantity surveyors were 4% each. Whereas, residential engineers and construction engineers were 2% each.

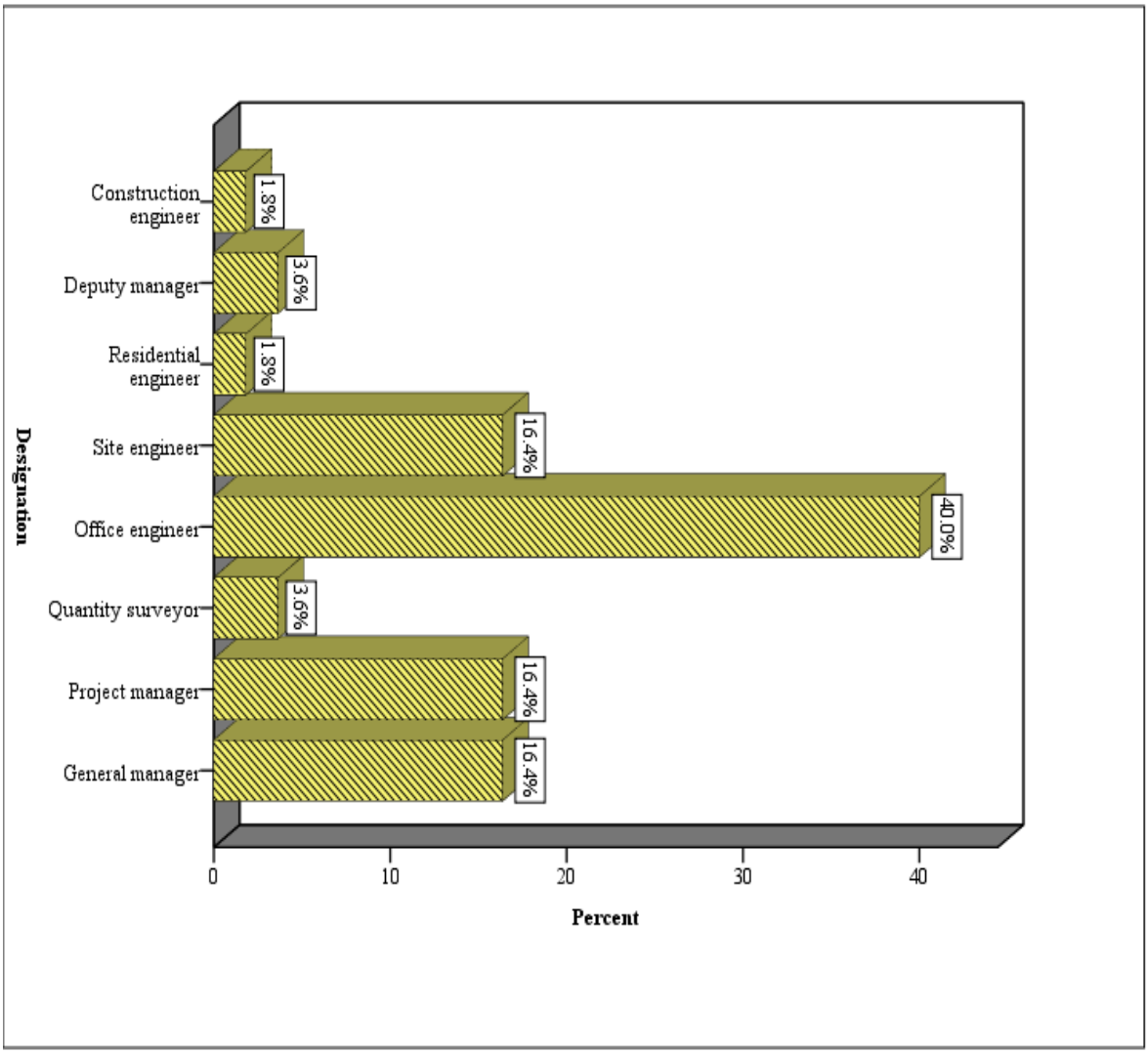


Figure 5.6. *Positions of the respondents*

5.2. Respondents' Awareness on Risk Management

The survey shows that all 55 respondents were aware of the concept of risk management. When asked how they came to know about risk management as given in Figure 5.7, 63.6% replied that they had taken construction management courses from the universities they graduated and learned there about risks in construction projects. Less than half of the participants (34.5%) replied that they took training about risk management funded by their company while only one respondent (1.8%) told that he learned risk management through experience.

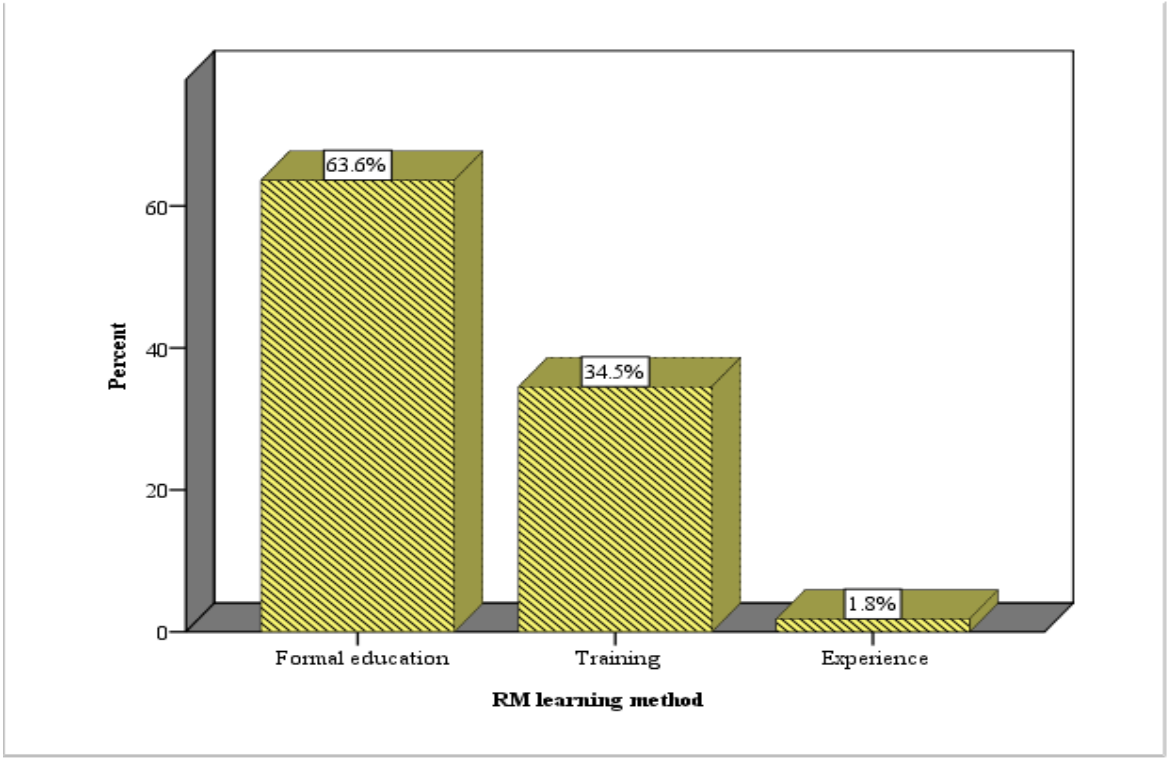


Figure 5.7. *Risk management learning methods*

For the evaluation of their knowledge of risk management principles, respondents were asked to measure their level of risk management awareness as very low, low, medium, high or very high. Almost all respondents answered that they have a low (36.4%) or medium (58.2%) level of risk awareness, and only 5.5% of the participants rated their perception of risk management as high (Figure 5.8). Although all of the respondents claimed that they know risk management, most of the respondents (94.6%) do not have enough confidence to rate their awareness as high; this implies that most of the respondents could not apply risk management principles in their projects. Therefore, increasing workers' risk management awareness is needed to upgrade their confidence to implement risk management techniques in the construction projects.

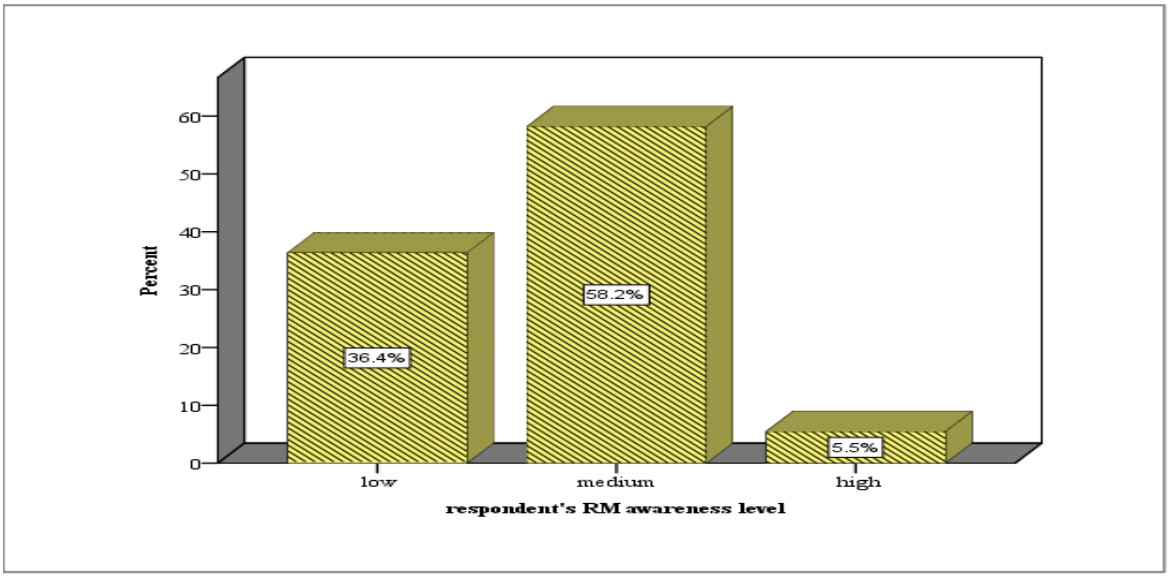


Figure 5.8. *Respondents' risk management awareness level*

5.3. Risk Management Practices in the Company

Most of the respondents (60%) declared that their companies do not practice risk management principles (Figure 5.9). They presented three barriers to the implementation of risk management. The main obstacle preventing formal risk management practice implementation shown in Figure 5.10 was lack of knowledge (51.5%). This result supports the argument of Hwang et al. (2014) and Smith and Bohn (1999) that lack of knowledge hinders RM implementation in small projects.

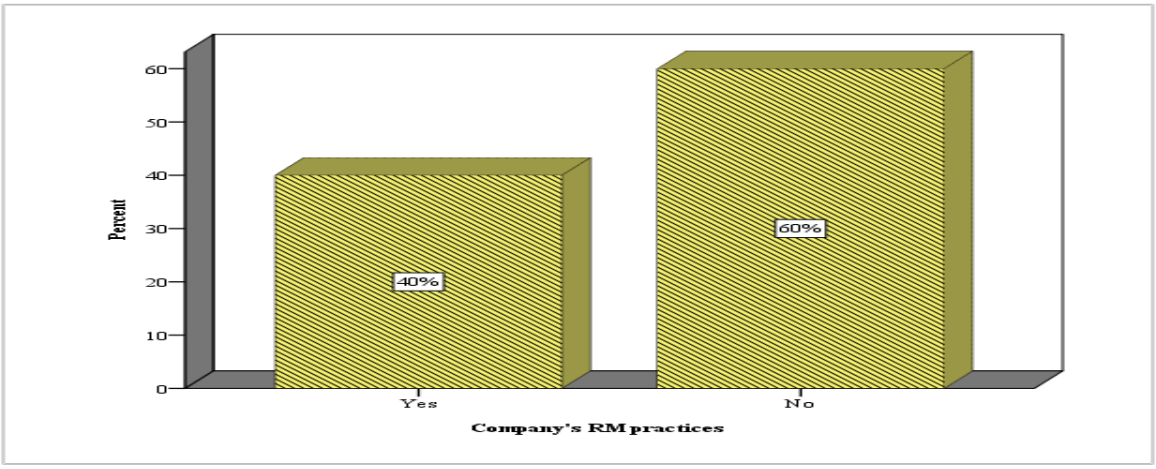


Figure 5.9. *Risk management practices in the companies*

Lack of budget (30.3%) which relates to the expense of RM implementation was the second impactful barrier. The remaining obstacle was the complex nature of risk management process techniques (18.2%) compared to the project sizes. Since most of the projects conducted by the respondents were small in size, the respondents believed that any money spent in RM in these projects would be relatively large to project cost.

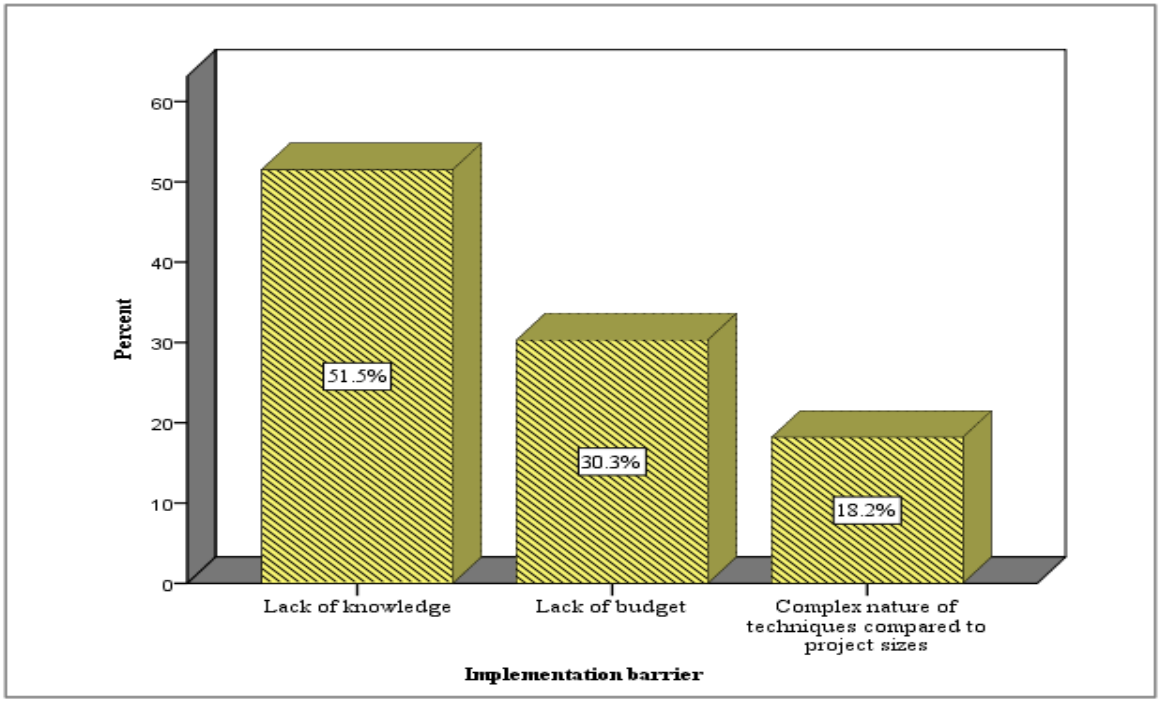


Figure 5.10. *Risk management implementation barriers*

The biggest goal of the remaining companies practicing risk management was to increase profitability (60%) of the company. Accelerating the market value of the company (55%) took the second position of the main goals of RM practices. More than one third (35%) of the respondents selected securing company's existence as one of the goals for RM. Reducing cashflow fluctuations was one of the main goals for only 25% of the respondents as given in Figure 5.11. Some of the respondents selected more than one alternative for the purposes behind risk management as can be seen from the sum of the respondent percentages (175%) in Figure 5.11.

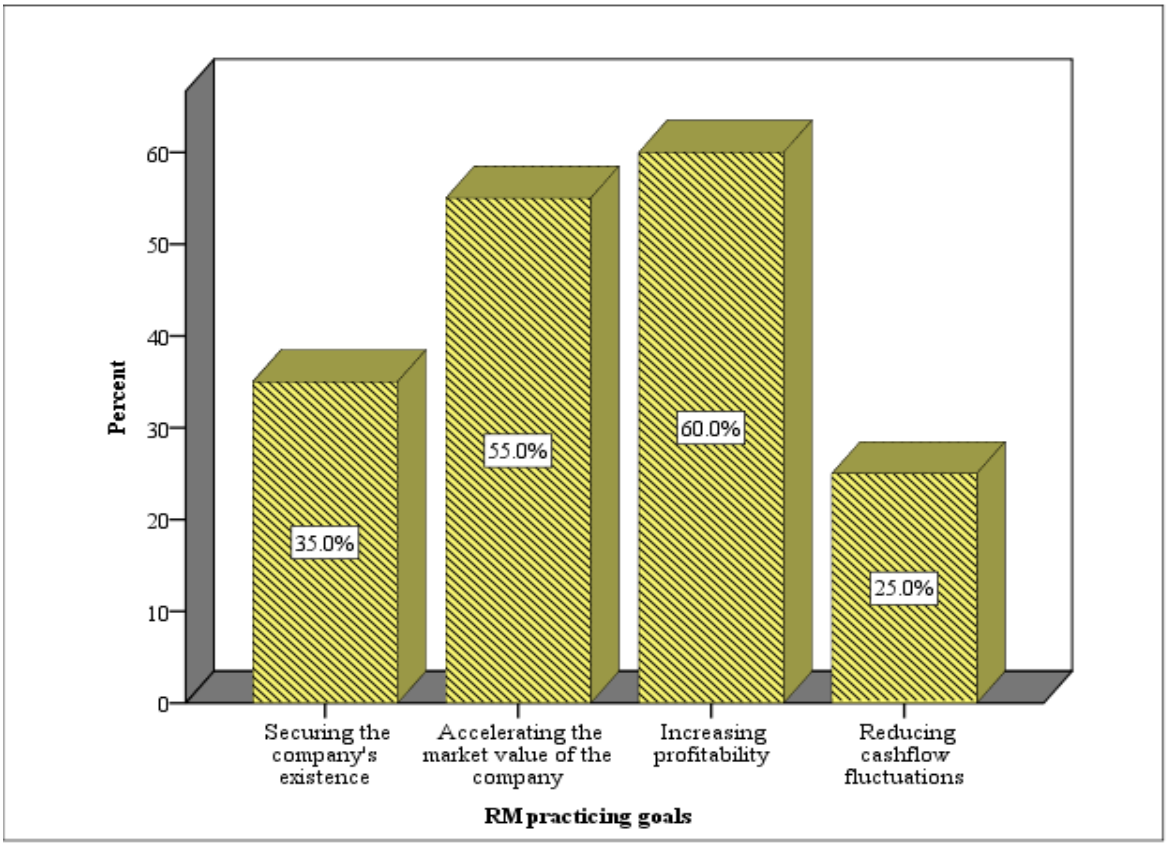


Figure 5.11. *Goals for risk management practices*

In terms of RM practices in the project phases, Figure 5.12 shows that most of the companies (63.2%) used RM in the construction phase. More than one third (36.8%) practiced in the design phase and 26.3% of the companies drilled in the predesign phase. As mentioned earlier in the literature review, risk management options in the project's early stages are very broad (Smith, Merna, and Jobling, 2006) and need to be argued enough with high strategic decisions (Wood and Ellis, 2003). From the survey, RM was practiced least in the predesign phase which shows that managing risk was not considered enough with high strategic decisions in the predesign phase.

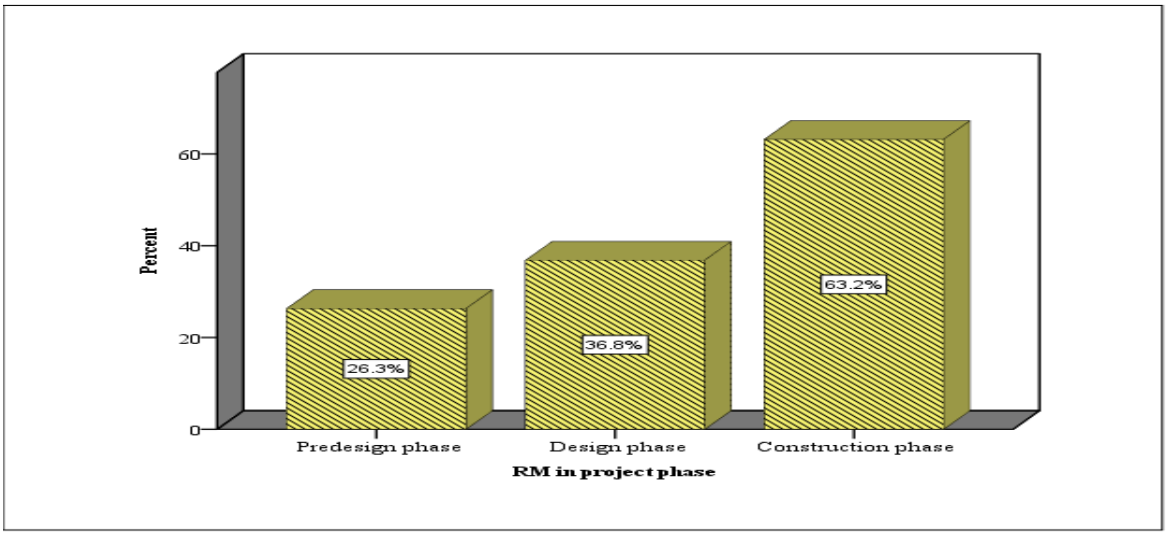


Figure 5.12. *Importance of risk management at the project life cycle stages*

The responsible bodies of the risk management in construction projects of the Somali region were 41% project managers, 4.5% clients, and 54.5% consultants. The project managers were responsible for managing risks occurring on the site when the construction begins. However, the clients had the responsibility to response any risk which occurs before and during the construction period. There is no specialized team for risk management in the region. That supports Mesfin's (2014) claim stating that there is no dedicated risk management team in most Ethiopian building construction projects.

5.4. Risk management process practices

To show how the risk management process is practiced in the construction companies, respondents were asked five different questions concerning the methods of risk management. The issues were how do you identify risks? How do you assess the likelihood of risks (qualitatively analyze)? How do you estimate the risk's severity on project objectives (quantitatively analyze)? How do you respond to risks? Moreover, how do you transfer/allocate risks?

In terms of risk identification some respondents chose different alternatives. Previous projects were the primary source and references of potential risks, to assure risks that happened earlier not to happen again. Respondents widely used documentation reviews

(75%) of the previous projects in risk identification processes. Interviewing experts (56.2%) was the second technique used mostly in Somali region's construction projects. Almost all companies had an employee giving consultation for the wellbeing of the company and warning the risk that might happen for doing a project or any activity in the company. Risk breakdown structure (RBS) technique was applied for more detailed works by some practitioners (25%). Some other practitioners (12.5%) who provide project's technical services used Checklists.

In general, risks are analyzed by performing a qualitative risk analysis technique and quantitative risk analysis technique (PMI, 2013; Pritchard, 2015). Performing qualitative analysis enables the managers to minimize risk's uncertainty and evaluate the consequence of the assumed risks. Whereas, performing quantitative analysis enables managers to analyze numerically risks affecting on project objectives.

All the RM practitioners in Somali region assessed the probability of risk by using either experience or expert judgment. Ranking the importance of risks based on experience (68.2%) was the mainly used qualitative risk analysis technique. Whereas, the percentage of probability risk rating based on the expert judgment was the remaining 31.8% as shown in Table 5.1. According to this research, all respondents did not use risk analysis methods like Monte Carlo. The result of the studies done by Gajewska and Ropel (2011) and Lyons and Skitmore (2004) also found that structured methods like risk impact assessment or Monte Carlo are not frequently used. Sensitivity analysis (59.1%) was the mostly used quantitative analysis method followed by event tree analysis (31.8%).

Most of the respondents (83.3%) agreed that risk reduction was the primary risk response method used in the companies followed by risk avoidance (38.9%). According to the studies conducted by Mesfin (2014), Gajewska and Ropel (2011) and Lyons and Skitmore (2004), the risk reduction was the most often chosen response against risks. This means, a large percentage of respondents try to reduce the risk's possibility that can influence the project objectives. Participants also took any action that can eliminate the likelihood or consequence of risk if it occurs. Transferring risk to other parties was the least used response method. Giving in mind that risk transfer does not eliminate the risks (Marques and Berg, 2011); it simplifies them to be better handled by the parties in the best position to control risks. State-owned construction firms mostly accepted any threats because of the

government's support when the firm goes into liquidation. Negotiation (45.4%) was the tool mainly applied for risk transfer. The results are gathered in Table 5.1.

Table 5.1. *Risk management process techniques*

Risk Management process	Technique/strategy	Frequency	Percent response (%)
Risk identification	Documentation reviews	12	75.0
	Expert interviews	9	56.2
	RBS	4	25.0
	Checklists	2	12.5
	Total	27	168.7
Qualitative risk analysis	Rating probability of risk based on expert judgment	7	31.8
	Ranking the importance of risk based on experience	15	68.2
	Total	22	100
Quantitative risk analysis	Event tree analysis	7	31.8
	Fault tree analysis	2	9.1
	Sensitivity analysis	13	59.1
	Total	22	100
Risk responding	Avoidance/Prevention	7	38.9
	Reduction/Mitigation	15	83.3
	Transfer	1	5.6
	Retention	2	11.1
	Total	25	138.9
Risk transfer	Negotiation	10	45.4
	Paying risk premiums for the party willing to take the risk	4	18.2
	Allocating risk to the party in the best position to control risk through contract clauses	8	36.4
	Total	22	100

5.5. Active Risk Factors in Somali Region Construction Projects

All of the respondents stated that many of their projects failed to achieve its objectives due to different risks encountering it. As mentioned in the literature review collecting risks is not easy work. In this study, the primary bases for risk collecting were articles about risk management. After getting 53 risk factors from the literature review (Mishra and Mallik 2017; Jung and Han 2017; Jayasudha and Vidivelli 2016; Mbachu and Taylor 2014; Marques and Berg 2011; Andi 2006; Hastak and Shaked 2000, Zhi 1995), the respondents were requested to evaluate the probability of occurrence of the identified risks and their impact on construction projects by using 1-5 Likert scale. The likelihood of occurrence and impact of each risk was analyzed according to their mean values and standard deviations as can be seen in Table 5.2.

The most occurring managerial risk was the changes of the top managers in the companies. The big companies in the survey were state-owned construction enterprises in which the regional government appoints their top management. All the senior managerial employees in the big companies were working for less than two years in their positions. The most impactful risk among managerial risks was the insufficient capability of the companies in contract management.

Changes in the scope of work and design were the most robust contractual risk which causes constant changes of contract and order of variations followed by inaccurate quantity and cost estimate. Also, changes in the scope of work and design were the most impactful among contractual risks in the construction projects of the Somali region.

Delays in payment have the highest rank of occurrence among the financial risks and ranked fourth in overall risk factors followed by financial difficulties in the construction companies. Delays in payment were also the most impactful risk on project objectives among identified risk factors. Design errors ranked first in the occurrence of overall risks and second in the influence of risk factors on the project objectives. Similarly, it is the most occurring and most influential risk factors among technical risks followed by insufficiently experienced staffs in terms of occurrence and lack of relevant training in terms of impacts. The latter two risk factors emphasize that the probability of a design error is high whenever inexperienced staff or untrained staffs do the design.

Poor quality of construction materials used in the projects was the most occurring and impactful risk factor among material risks. Executing companies on the projects were mostly using the cheapest materials available on the market similar to the one in the design to get a significant profit. That sometimes caused to the construction project not to meet its objectives.

Table 5.2. *Active risk factors*

S. No.	Risk category	Risk factor	Probability of occurrence		Level of impact		Risk category's average mean impact	Risk category's rank
			Mean	Rank	Mean	Rank		
1	Managerial	Top management changes	3.3878	2	3.1633	20	3.126	4
2		Insufficient organizational management capability	2.6735	19	2.7143	46		
3		Insufficient contract management capability	2.8222	11	3.5000	5		
4	Contractual	Change in scope of work and design	3.0208	5	3.6364	3	3.156	3
5		Ambiguous clauses in the contract	2.2381	45	2.8837	40		
6		Inaccurate quantity and cost estimate	2.9333	9	3.2245	17		
7		Lack of fairness during tendering process	2.5306	29	3.1429	23		
8		Low bid price	2.3404	42	2.9348	37		
9		Change orders	2.5366	27	3.1277	25		
10		Inaccurate time estimates	2.5745	23	3.1400	24		
11	Financial/Economic	Financial difficulties	2.9796	7	3.2326	15	3.243	1
12		Delays in payment	3.1250	4	3.8723	1		
13		Local taxes	2.4565	37	3.2449	14		
14		Inflations	2.4792	34	2.9796	34		
15		A bankruptcy of a project partner	2.3953	41	2.8043	42		
16		Change in labor costs	2.7872	14	3.2245	17		
17		Improper forecasting of market demand	2.6735	19	3.3400	8		

Table 5.2. *(continue) Active risk factors*

18		Economic Crises	2.1702	50	3.2449	14		
19	Technical	Insufficient site examination	2.5400	25	3.0652	27	3.235	2
20		Design errors	4.0185	1	3.7083	2		
21		Unavailability of skilled labors	2.4468	38	3.3404	7		
22		Inadequate engineering experts	2.5306	29	3.1489	21		
23		Insufficiently experienced staffs	3.2727	3	3.2857	12		
24		Inadequate contractor experience	2.6981	17	3.0612	28		
25		Lack of consultant experience	2.5400	25	2.9375	36		
26		Lack of relevant training	2.8085	13	3.3333	9		
27	Material	Unavailability of materials needed in the project	2.7500	15	2.6200	51	3.053	5
28		Unfavorable suppliers and sub-suppliers	2.5102	32	3.0208	31		
29		Poor quality of construction materials	2.8200	12	3.5185	4		
30	Environmental	Weather and seasonal consequences	2.6087	22	2.7647	45	2.967	8
31		Geology and soil type of the site	2.4792	34	2.9149	39		
32		Unforeseen ground conditions	2.1633	51	2.7000	48		
33		Floods	2.2200	47	3.4889	6		
34	Social/Cultural	Language barriers	2.4694	35	3.0227	30	2.808	10
35		Cultural differences	2.3191	43	2.4468	53		
36		Bribe and corruption	3.0204	6	3.1915	19		
37		Insecurity and crime pestilence	2.2041	48	2.5714	52		
38	Political	Fragmented political structure	2.2200	47	2.6250	50	2.847	9
39		Regional or national political oppositions	2.5208	30	2.7843	44		

Table 5.2. *(continue) Active risk factors*

40		Hostilities with neighboring region/country	2.1702	50	2.9200	38		
41		Political changes	2.4565	37	2.8049	41		
42		Civil strikes or disorders	2.2800	44	2.6429	49		
43		Influence of power groups	2.8605	10	3.3061	11		
44	Safety	Safety and health care standard problems	2.6667	21	3.0200	32	2.976	7
45		Trips and falls	2.0625	52	3.2075	18		
46		Fire and electricity	1.8298	53	2.7021	47		
47	Legal	Incorrect confirmation of contract document	2.7200	16	3.1429	23	3.046	6
48		Breach of contract by project partner	2.5102	32	3.0000	33		
49		Legal use of land and property	2.4286	39	3.0417	29		
50		Customs and import restrictions and procedures	2.9545	8	3.3191	10		
51		Constraints of employment and material availabilities	2.4118	40	3.0667	26		
52		Complex planning approval and permit procedures	2.5400	25	2.7959	43		
53		Legal disputes among different parties	2.6735	19	2.9600	35		

Floods were among the most impactful risk factors on project objectives especially to the companies working on small dams and irrigation works, while weather and seasonal consequences had the highest probability among the environmental risks. Bribe and corruption ranked sixth in overall risk factors, where most of the bidding works were taken through bribery. Cultural differences have no impacts on construction projects in the region because the companies were working locally and the firm owners, as well as top managers,

had the same culture to that of the community in the region. The influence of power groups (high ranking officials in the regional government) had the highest impact and probability among political risks. Adding a project to some activities not in the contract due to the order of more senior government officials or giving a bid to an unsuitable contractor by the command of a government officer was the influence of the power groups to the projects.

Trips and falls had the worst impact among safety risks on the projects, caused by mostly the scaffolding's materials and type used in the site. All of the scaffoldings used in the sites were made up of timber. Some of the scaffoldings were not strong enough to support the workers and construction materials on it. The availability of new machines and quality materials were limited in the construction projects due to the restrictions of the customs and import procedures in the region.

The respondents were asked to rank the impact of the identified risks on project's objectives in terms of time, cost and quality. To save the time of the respondents only the broad ten categories of the risks were used as shown in Table 5.3.

Table 5.3. *Impact of different risk types on construction projects*

Risk type	Impact						Average impact	
	Time		Cost		Quality			
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Managerial	2.98	4	3.08	3.5	2.90	5	2.987	4
Contractual	3.08	3	3.08	3.5	3.00	3	3.053	3
Financial/Economic	3.20	1	3.24	1	3.23	4	3.223	1
Technical	3.13	2	3.23	2	2.95	1	3.103	2
Material	2.69	9	3.00	6	3.11	2	2.933	5
Environmental	2.77	7	2.44	8	2.89	6	2.700	8
Social/Cultural	2.49	10	2.32	10	2.79	9	2.533	10
Political	2.75	8	2.39	9	2.53	10	2.557	9
Safety	2.78	6	2.83	7	2.88	7	2.830	7
Legal	2.85	5	3.02	5	2.81	8	2.893	6

Table 5.3 shows that financial or economic risks have the highest impact on the project's schedule, and cost. Majority of respondents regard that financial and technical risks have the most significant impact on the project's cost while social risks have the lowest impact on cost. In general, the respondents believe that financial, technical, contractual, managerial and material are the highest five critical risks on project objectives. Comparing

the ranks of the average impact column of Table 5.2 to that of Table 5.3, one can see that the rank of each risk type is the same in both tables.

5.5.1. T-test analyses for active risks

The t-test is used to determine if there is a significance difference between the average means of risk categories in column 8 of both Table 5.2 and Table 5.3. The significance level (Alpha value) is set to be 0.05. The two mean groups are examined with that alpha value. The significance value (P-value) in Table 5.4 is used to evaluate the group differences. If the value (p-value) is greater than 0.05, the groups can be treated as the same and no significant differences exists but if the value is less than 0.05 than there is a significant difference between the groups.

Table 5.4. *T- test for active risks*

Table 5.2 Col. 8		Table 5.3 Col. 8					
Mean	Variance	Mean	Variance	df	t-Stat	P-value	t-Critical
3.0457	0.022273789	2.8812	0.052373067	15	1.903970185	0.076277843	2.131449546

Table 5.4 shows a p-value (0.076) which is greater than the significance value (0.05), as well as a 2.131 t-Critical value which is greater than a t-Stat of 1.904. These values proof that the average means of the two tables are the same, and can be derived the same results. In other words, there are no significant differences between the values in Table 5.2 and Table 5.3.

Last but not least, respondents were asked if they have any suggestion to improve the odds of project objectives and to reduce risks in SRS construction projects. However, no respondent gave any suggestion to that question. When asked whether risk management plays a major role in successful completion of construction projects, 56.4% strongly agreed, 34.5% agreed, 7.3% neither agreed nor disagreed whereas 1.8% did not agree.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

As mentioned in the literature review, the construction industry plays a significant role in any country's economy, and it faces different risks and uncertainties. Managing risks is an important process to achieve the construction project's objectives. The primary aim of this study was to examine the status quo of risk management in Somali regional state's construction projects. Additional goals of this study were to know the level of risk management awareness of construction stakeholders in the region and to identify the level of risk management practice in construction projects. Further, it was the objective of this study to determine the barriers to the implementation of risk management practices and to study the most effective risk factors in meeting project objectives. To achieve these objectives questionnaire survey was used as a research instrument. The information gathered from the survey was analyzed using descriptive statistics with the help of SPSS. Most effective risk factors were ranked using their mean values.

The following conclusions from the research findings were summarized under the research objectives:

1. All of the stakeholders in Somali regional state's construction projects were aware of the importance of risk management, but very few had adequate knowledge to apply the risk management techniques to their projects.
2. More than half of the parties did not practice risk management techniques in their projects. The barriers to practicing risk management were lack of knowledge, lack of budget and the complex nature of risk management process techniques.
3. The most ranked risk factors occurring in the Somali region's construction projects were design errors, top management changes, lack of staff experience, and delays in payments. The most negatively affecting risks to projects were delays in payment, design errors, change in scope of work and design, and poor quality of construction materials.
4. The RM techniques applied in projects were highly dependent on judgments and expertise.

5. Risk reduction and risk avoidance were frequently used risk response techniques of the construction projects in the region.

6.2. Recommendations

Based on the research findings which show a low level of risk management practice for those companies applying it, and none existence of RM practice for more than half of the companies in the Somali region, the following improvements are recommended to enhance the current condition of RM practices in the region:

1. Since most of the parties involved in construction projects did not have enough knowledge to practice Risk management techniques, regular training and workshops on this subject need to be given to the stakeholders. All parties are encouraged to improve their understanding of RM and increase their confidence to practice it.
2. Management of financial, technical, contractual, managerial and material risk types need to be given a significant consideration since they are the most substantial risks in the Somali region's construction projects.
3. Since, there were no risk management experts in the area, establishing a specialized risk management team is highly recommended in the Somali region's construction projects.
4. Dealing with risk-taking responsibility or risk allocation, relevant clauses defining the way risk to be allocated to the parties must be included in the construction contract.
5. Further researches conducting case studies on the most influential risk types in the region are also recommended.
6. All parties are advised to participate and support willingly in research questionnaires to come up with beneficial findings.

REFERENCES

Ahmed, S. M., Ahmad, R., and Saram, D. D. (1999). Risk management trends in the Hong Kong construction industry: a comparison of contractors and owners perceptions. *Engineering, Construction and Architectural Management*, *6*(3), 225–234.

Al-Bahar, J. F., and Crandall, K. C. (1990). Systematic risk management approach for construction projects. *Journal of Construction Engineering and Management*, *116*(3), 533–546.

Ali, T. H. (2006). *Influence of National Culture on Construction Safety Climate in Pakistan*. PhD thesis, Place of publication: Griffith University.

Andi. (2006). The importance and allocation of risks in Indonesian construction projects. *Construction Management and Economics*, *24*(1), 69–80.

Argaw, B. A. (2017). *Regional inequality of economic outcomes and opportunities in Ethiopia A tale of two periods* (No. 2017/118).

Ashley, D. B., and Bonner, J. J. (1987). Political risks in international construction. *Journal of Construction Engineering and Management*, *113*(3), 447–467.

Aven, T., and Renn, O. (2009). On risk defined as an event where the outcome is uncertain. *Journal of Risk Research*, *12*(1), 1–11.

Bennett, F. L. (2003). *The Management of Construction*. *Journal of Visual Languages and Computing*. USA and Canada: Butterworth-Heinemann.

Blackman, A. (2015). Effective Risk Management Strategies. Retrieved September 10, 2017, from https://business.tutsplus.com/tutorials/effective-risk-management-strategies--cms-22887 1/12.

Campbell, S. (2005). Determining overall risk. *Journal of Risk Research*, *8*(7–8), 569–581.

Chapman, C., and Ward, S. (2003). *Project Risk Management:Process Techniques and Insights* (Second edition). Chichester: John Wiley and Sons.

Chen, J. (2018). Management Risk. Retrieved July 4, 2019, from https://www.investopedia.com/terms/m/managementrisk.asp.

Chileshe, N., and John Kikwasi, G. (2014). Risk assessment and management practices (RAMP) within the Tanzania construction industry: Implementation barriers and advocated solutions. *International Journal of Construction Management*, *14*(4), 239–

254.

Connick, B. J., Ihenacho, K., Mbaluto, J., Chance, C., and Campbell, C. (2012). Managing Political Risk in Emerging Markets. *Emerging Markets Private Equity Association (EMPEA) Legal and Regulatory Bulletin*, 1–4.

Cooper, D., Grey, S., Raymond, G., and Walker, P. (2005). *Project Risk Management Guidelines: managing risk in large projects and complex procurements*. Chichester: John wiley and Sonsls, Ltd.

CSA. (2006). *Report on the 2005 National Labour Force Survey*.

Debela, G. Y. (2014). *The Practice of Construction Risks Management Through Insurance in the Ethiopian Federal Road Projects*. MSc thesis, Place of publication: Addis Ababa University.

Desta, S. S. (2015). *The Management of Construction Processes in Developing Countries : A Case Study of the Ethiopian Roads Authority*. PhD thesis, Place of publication: University of Cape Town.

Dikmen, I., Budayan, C., Birgonul, M. T., and Hayat, E. (2018). Effects of Risk Attitude and Controllability Assumption on Risk Ratings : Observational Study on International Construction Project Risk Assessment. *Journal of Management in Engineering*, *34*(6), 1–12.

Dinku, A. (2016). *Construction Management and Finance* (first edition). New Delhi: Laxmi Publications (P) LTD.

Dubois, A., and Gadde, L. E. (2002). The construction industry as a loosely coupled system: Implications for productivity and innovation. *Construction Management and Economics*, *20*(7), 621–631.

Edwards, P. J., and Bowen, P. A. (1998). risk and risk management in construction: a review and future directions for reseaarch. *Engineering, Construction and Architectural Management*, *5*(4), 339–349.

EEA. (2008). *Report on the Ethiopian Economy: the Current State of the Construction Industry* (Vol. VI.2006/07).

Fan, M., Lin, N.-P., and Sheu, C. (2008). Choosing a project risk-handling strategy: An analytical model. *International Journal of Production Economics*, *112*(2), 700–713.

Gajewska, E., and Ropel, M. (2011). *Risk Management Practices in a Construction Project*

- *a case study*. MSc thesis, Place of publication: Chalmers University of Technology.

Hillson, D. (2004). *Effective Opportunity Management for Projects: Exploiting Positive Risk*. Edited by Center for Business Practices. Vol. 11. New York: Marcel Dekker,Inc.

Hillson, D. (2009). *Managing Risk in Projects*. *Gower, UK*. Gower Publishing Limited.

Hwang, B. G., Zhao, X., and Toh, L. P. (2014). Risk management in small construction projects in Singapore: Status, barriers and impact. *International Journal of Project Management*, *32*, 116–124.

Ibbs, C. W., Kwak, Y. H., Ng, T., and Odabasi, A. M. (2003). Project Delivery Systems and Project Change : Quantitative Analysis. *Journal of Construction Engineering and Management*, *129*(4), 382–387.

Jayasudha, K., and Vidivelli, B. (2016). Analysis of major risks in construction projects. *ARPN Journal of Engineering and Applied Sciences*, *11*(11), 6943–6950.

Jung, W., and Han, S. H. (2017). Which Risk Management Is Most Crucial for Controlling Project Cost? *Journal of Management in Engineering*, *33*(5), 1–13.

Karimiazari, A., Mousavi, N., Mousavi, S. F., and Hosseini, S. (2011). Risk assessment model selection in construction industry. *Expert Systems with Applications*, *38*(8), 9105–9111.

Kartam, N. A. (1996). Making Effective Use of Construction Lessons Learned in Project Life Cycle. *Journal of Construction Engineering and Management*, *122*(1), 14–21.

Kartam, N. A., and Kartam, S. A. (2001). Risk and its management in the Kuwaiti construction industry : a contractors ' perspective. *International Journal of Project Management*, *19*, 325–335.

Kendrick, T. (2015). *Identifying and Managing Project Risk: Essential Tools for Failure-Proofing Your Project* (Third edition). New York, NY 10019: AMACOM.

Keshk, A. M., Maarouf, I., and Annany, Y. (2018). Special studies in management of construction project risks , risk concept , plan building , risk quantitative and qualitative analysis , risk response strategies. *Alexandria Engineering Journal*, *57*(4), 3179–3187.

Kivrak, S., Ross, A., Arslan, G., and Tuncan, M. (2009). Impacts of Cultural Differences on Project Success in Construction. In *25th Annual ARCOM Conference* (pp. 53–61). Nottingham, UK: Association of Researchers in Construction Management.

Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Boston and New York: Houghton Mifflin

Kumar, K., and Harison, A. (2016). Risk management during project life cycle. *International Journal of Scientific Engineering and Applied Sciences*, *2*(6), 55–69.

Lam, K. C., Wang, D., Lee, P. T. K., and Tsang, Y. T. (2007). Modelling risk allocation decision in construction contracts. *International Journal of Project Management*, *25*(5), 485–493.

Lester, A. (2006). *Project Management Planning and Control* (fifth edition). Elsevier Science and Technology Books.

Liu, J. Y., Low, S. P., and He, X. (2011). Current practices and challenges of implementing enterprise risk management (ERM) in Chinese construction enterprises. *International Journal of Construction Management*, *11*(4), 49–63.

Luo, L., He, Q., Jaselskis, E. J., and Xie, J. (2017). Construction Project Complexity : Research Trends and Implications. *Journal of Construction Engineering and Management*, *143*(7), 1–10.

Lyons, T., and Skitmore, M. (2004). Project risk management in the Queensland engineering construction industry : a survey. *International Journal of Project Management*, *22*, 51–61.

MAPFRE. (2012). *Manual on Construction Risks, Damage To the Works and Advanced Loss of Profits (Alop) Index of Contents*.

Marques, R. C., and Berg, S. (2011). Risks, contracts and private-sector participation in infrastructure. *Journal of Construction Engineering and Management*, *137*(11), 925–932.

Mbachu, J., and Taylor, S. (2014). Contractual Risks in the New Zealand Construction Industry: Analysis and Mitigation Measures. *International Journal of Construction Supply Chain Management*, *4*(2), 22–33.

Mehta, M., Scarborough, W., and Armpriest, D. (2009). *Building Construction: Principles Materials and Systems*. New Jersey: Pearson Prentice Hall.

Mesfin, A. (2014). *A Study on Construction Contract Risk Management Practices in Ethiopian Building Construction Projects*. MSc thesis, Place of publication: Addis Ababa University.

Miller, R., and Lessard, D. (2001). Understanding and managing risks in large engineering projects. *International Journal of Project Management*, *19*, 437–443.

Mishra, A. K., and Mallik, K. (2017). Factors and Impact of Risk Management Practice on Success of Construction Projects of Housing Developers , Kathmandu, Nepal. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *36*(7), 206–232.

MoFED. (2015). *Public Finance Management Assessment Somali Regional Government: Public Expenditure Financial Accountability Framework (PEFA)*.

Ofori, G. (2012). Developing the construction industry in Ghana: the case for a central agency. *National University of Singapore Omega*, *25*(March), 415–435.

Partnerships Victoria (2001). Risk Allocation and Contractual Issues. Department of Treasury and Finance.

PMI. (2013). *A Guide to the Project Management Body of Knowledge: PMBOK® Guide*. *Project Management Institute, Inc.* (fifth edition).

Pritchard, C. L. (2015). *Risk management: concepts and guidance* (fifth edition). CRC Press.

Raftery, J. (1994). *Risk analyses in project management*. London. E and FN Spon.

Raz, T., and Hillson, D. (2005). A Comparative Review of Risk Management Standards. *Risk Management: An International Journal*, *7*(4), 53–66.

RIBA. (2013). RIBA Small Project Plan of Work.

Riddell, T. (2017). The 5 Stages of Project Management - Understanding a Construction Project's Life Cycle. Retrieved from https://esub.com/5-stages-project-management-understanding-construction-projects-life-cycle/

Rosa, E. A. (1998). Metatheoretical foundations for post-normal risk. *Journal of Risk Research*, *1*(1), 15–44.

Sayegh, S. M. El. (2014). Project risk management practices in the UAE construction industry. *International Journal of Project Organisation and Management*, *6*(1/2), 121.

Schwab, K. (2017). *The Global Competitiveness Report 2017-2018*. *World Economic Forum*. https://doi.org/92-95044-35-5

Serpella, A. F., Ferrada, X., Howard, R., and Rubio, L. (2014). Risk Management in Construction Projects: A Knowledge-based Approach. *Procedia - Social and Behavioral Sciences*, *119*, 653–662.

Smith, G. R., and Bohn, C. M. (1999). Small to Medium Contractor Contingency and Assumption of Risk. *Journal of Construction Engineering and Management*, *125*(2),

101–108.

Smith, N., Merna, T., and Jobling, P. (2006). *Managing Risk in Construction Projects* (second edition). Blackwell Publishing Ltd.

Šotić, A., and Rajić, R. (2015). The Review of the Definition of Risk. *Online Journal of Applied Knowledge Management*, *3*(3), 17–26.

Spacey, J. (2015). What is Legal Risk? Retrieved January 8, 2019, from https://simplicable.com/new/legal-risk

Visser, K., and Joubert, P. (2008). Risk Assessment Modelling for the South African Construction Industry. *PICMET '08 - 2008 Portland International Conference on Management of Engineering & Technology*, (c), 1371–1379.

Wang, S. Q., Dulaimi, M. F., and Aguria, M. Y. (2004). Risk management framework for construction projects in developing countries. *Construction Management and Economics*, *22*(3), 237–252.

Westland, J. (2006). *The Project Management Life Cycle*. London and Philadelphia.

Wood, G. D., and Ellis, R. C. T. (2003). Risk management practices of leading UK cost consultants. *Engineering, Construction and Architectural Management*, *10*(4), 254–262.

Yimam, A. H. (2011). *Project Management Maturity in the Construction Industry of Developing Countries: the Case of Ethiopian Contractors*. MSc thesis, Place of publication: University of Maryland.

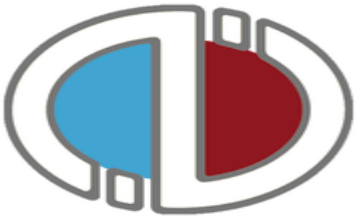
Zewdu, Z. T. (2016). Construction Projects Delay and Their Antidotes: The Case of Ethiopian Construction Sector. *International Journal of Business and Economics Research*, *5*(4), 113–122.

Zhi, H. (1995). Risk management for overseas construction projects. *International Journal of Project Management*, *13*(4), 231–237.

Zou, P. X. W., and Zhang, G. (2009). Comparative Study on the Perception of Construction Safety Risks in China and Australia. *Journal of Construction Engineering and Management*, *135*(7), 620–627.

Zuo, F., and Zhang, K. (2018). Selection of risk response actions with consideration of secondary risks. *International Journal of Project Management*, *36*(2), 241–254.

APPENDIX



Anadolu University

Civil Engineering Department

Dear Sir/Madam,

The importance of risk management increases every day, as the complexity and uncertainties in construction projects increase. Managing negative impacts of risks on construction projects helps to meet the successful completion of project objectives. Currently, research titled as “risk management practices in construction projects of Somali regional state in Ethiopia” is conducted.

We believe that this research will provide many benefits for construction companies working locally in the Somali region, nationally in Ethiopia and internationally for foreign companies. Your willingness to participate in this research project is very crucial to the success of this study.

Sincerely,

Omar Hiis UDAN
MSc student
Construction management division

Assoc. Prof. Dr. Serkan KIVRAK
Supervisor
Construction Management Division

Anadolu University

Civil Engineering Department

Master of Science Thesis

MSc thesis title: Risk Management Practices in Construction Projects of Somali Regional State in Ethiopia

Please be assure that your responses will be kept with the highest confidentiality.

Thank you in advance for participating in this survey.
Please try to answer all the questions openly and carefully, as your answers will have an influence on the outcome of the research.

☑ Please tick the option which best fits to your response

Section One: Information about Your Company

1.1.What kind of stakeholder is your Company?

☐Client ☐Contractor ☐Consultancy ☐Sub-contractor
☐ Other, please specify _____

1.2.In which of the following areas in construction does your company operate?

☐Industrial ☐Residential ☐Commercial ☐Infrastructure
☐Health/welfare ☐Other, please specify _____

1.3.How many years has your company been working in that area?

☐0-5 years ☐6-10 years ☐11-20 years ☐21-30 years
☐above 30 years ☐do not know

1.4.What is the categorical grade of your company?

☐Grade 1 ☐Grade 2 ☐Grade 3 ☐Grade 4 ☐Grade 5
☐Grade 6 ☐Grade 7 ☐Grade 8 ☐Grade 9 ☐Grade 10

1.5.Where does your company's projects work in?

☐Local (only in Somali region) ☐National (all Ethiopian regions) ☐International
☐Both national and international

Section Two: Respondent's Professional Background

2.1.What is the level of your formal education?

☐BSc. ☐MSc. ☐PhD.

☐Other, Please Specify _____

2.2.What is your job title?

☐General manager ☐Project manager ☐ Quantity surveyor ☐Office engineer

☐Site engineer ☐ Residential engineer

☐Other, please indicate _____

2.3.How many years of experience do you have in the construction industry?

☐0-5 years ☐6-10 years ☐11-20 years ☐21-30 years

☐above 30 years

Section Three: Respondent's knowledge on Risk Management

3.1. Do you know Risk management principles in construction projects?

☐Yes ☐ No

3.2. How did you come to know the principle of risk management?

☐Through formal education ☐Through training

☐ Others, please specify_____

3.3. How do you evaluate your knowledge of risk management principles?

☐Very low ☐Low ☐Fair ☐High ☐ Very high

Section Four: Use of Risk Management in the Company's Projects

4.1. Does your company/enterprise/office use risk management techniques?

☐Yes ☐No

4.1.1. If your answer is No,

a) What is the barrier to risk management implementation?

☐Lack of knowledge

☐lack of budget

☐Sophisticated nature of the techniques compared to project sizes

☐Others, please specify _____

b) How do you deal with risks occurring in construction projects?

_____

_____

4.1.2. If your answer is Yes,

a) What are the main goals that your company use risk management practices?

☐Securing the company existence.
☐Accelerating the market value of the company/enterprise/office.
☐Increasing profitability.
☐ Reducing cashflow fluctuations
☐Influencing the behavior of subsidiaries and managerial employees.
☐Other, please specify _____

b) At what construction project stage does your company use risk management?

☐pre-design stage ☐construction stage
☐Design stage
☐Other, please specify _____

c) How do you identify risks?

☐Documentation reviews
☐Expert interviews
☐Using risk break down structures
☐Checklists
☐Others, please specify_____

d) How do you assess the likelihood of risks?

☐Using risk probability and Impact assessment
☐Using probability risk rating matrix
☐Ranking the importance of risks based on past experience
☐Others, specify please_____

e) How do you estimate the risk's severity on project objectives?

☐Event tree analyses ☐Sensitivity analyses
☐Fault tree analyses ☐Monte Carlo Simulation
☐Others, please specify _____

f) How do you respond risks?

☐Avoidance/Prevention ☐Transfer
☐Reduction/Mitigation ☐Retention
☐Other, please specify _____

g) How do you allocate risks?

☐By negotiation when the risk occurs

☐By paying risk premiums for the party willing to take the risk

☐By allocating risks to the part in the best position to control them through the contract clauses.

☐Others, please specify_____

4.2. Who is responsible for managing risks in your company/enterprise/office?

☐ The project manager ☐The consultant

☐ The client ☐ A specialized risk management team

☐Others, please specify _____

4.3. Did any of your projects fail to meet its objectives in terms of time, cost or quality? (i.e. did it faced any delay, quality problem or cost overrun?)

☐Yes ☐No

4.4. If your answer is No, what made you achieve all of your project objectives?

_____

_____

_____

Section five: Occurrence of Active risks and Their Impacts on Projects

5.1. Please rate the risks occurring in your construction projects? (1 = very low, 2 = low 3= moderate, 4= high 5 = very high.)

Risk factors	**Probability**					**Impact**				
	1	2	3	4	5	1	2	3	4	5
Change in scope of work and design										
Bribe and corruption										
Improper forecasting of market demand										
Lack of fairness during tendering process										
Change orders										
Financial difficulties										
Top management changes										
Inflations										
A bankruptcy of a project partner										
Insufficient contract management capability										
Change in labor costs										
Insufficient organizational management capability										
Economic Crises										
Ambiguous clauses in the contract										
Insufficient site examination										
Geology and soil type of the site										
Design errors										
Floods										
Insufficiently experienced staffs										
Unavailability of skilled labors										
Customs and import restrictions and procedures										
Lack of relevant training										
Unavailability of materials needed in the project										
Inaccurate quantity and cost estimate										
Unfavorable suppliers and sub-suppliers										
Low bid price										

5.1. (Continue)

Risk factors	Probability					Impact				
	1	2	3	4	5	1	2	3	4	5
Weather and seasonal consequences										
Inadequate contractor experience										
Constraints of employment and material availabilities										
Unforeseen ground conditions										
Complex planning approval and permit procedures										
Delays in payment										
Cultural differences										
Lack of consultant experience										
Poor quality of construction materials										
Insecurity and crime pestilence										
Inadequate engineering experts										
Regional or national political oppositions										
Inaccurate time estimates										
Local taxes										
Political changes										
Civil strikes or disorders										
Influence of power groups										
Safety and health care standard problems										
Fragmented political structure										
Trips and falls										
Hostilities with neighboring region/country										
Fire and electricity										
Incorrect confirmation of contract document										
Breach of contract by project partner										
Legal use of land and property										
Language barriers										
Legal disputes among different parties										

5.2. Please rate the impacts of the types of risks in terms of time, cost and quality? (1 = very low, 2 = low 3= moderate, 4= high 5 = very high.)

Risk	Impact														
	Time					Cost					Quality				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Contractual															
Financial/Economic															
Technical															
Material															
Environmental															
Social/Cultural															
Political															
Safety															
Legal															

5.3. What remedial measures do you suggest to improve the odds of project objectives and to reduce risks occurring in Somali Regional State construction projects?

_____
_____
_____
_____
_____

5.4. According to your experience, do you think risk management plays a major role in successful completion of a project?

☐Strongly disagree ☐ Disagree ☐ Neither agree nor disagree
☐ Agree ☐Strongly agree

Thank you