



**An Assessment of Contractors' Risk Management practices in Building Construction Projects: The case of Addis Ababa City Administration**

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## ABSTRACT

*By its very nature the construction industry is prone to risky situations that affect projects undertaken. Thus, there should be a risk management system to manage risks and ensure project objectives and thereby maintain success. In the process of running construction projects, often times, and contractors are challenged by various risks that need to be addressed. This study was conducted with the aim to assess the risk management practices of contractors who are currently operating in Addis Ababa, and they are all engaged in Building Construction projects. It tried to identify the major construction risk factors and examine their level of severity on project objectives. The study also explored the different preventive and remedial methods used as well as the relative use of different risk management practices and the common risk analysis techniques employed by contractors. Two tools, questionnaire and interview, were employed to collect relevant data. The questionnaire was distributed to 39 Level one contractors who were legally registered by Addis Ababa City Administration Building construction Permit Authority. For the data collected through questionnaire survey, the SPSS and relative importance Index were used for analysis. The results of the survey showed that the risk that belong to the major risk categories such as Physical, Design, Financial, construction and political were identified as high risk factors, and they affect construction projects significantly. Some of the risks identified from each category were: Poor safety procedures resulting into Accident Occurrence, Awarding the design to unqualified designers, Exchange rate fluctuation, Unrealistic Project Schedule, Lack of qualified & competent professionals and Changes in design. The finding showed that that contractors tend to use Avoiding risks as a method of risk prevention. Increasing the working hours was used as remedial method used by contractors. Also, the study identified that comparing Analysis which is comparing similar projects through similar conditions was the most used technique by contractors to analyze risks. However, the results from the interview discussion revealed that it is uncommon to analyze risks systematically. Risks are usually addressed after they happen, and contractors are often busy with fighting the fire instead of having advance precautions about the potential risk or threats. Based on the findings, the study recommended that risks that were identified as high in terms of their level of severity (such as the ones mentioned above) should be given attention in order to minimize the challenges building construction projects encounter and realize project objectives. For this to happen, there should be a well-established risk management system which considers risk as one of the major crucial components of construction projects. Besides, contractors should undergo proper professional training that targets risk preventative, Remedial and analysis techniques.*

## CHAPTER ONE

### Introduction

#### 1.1 Background

The construction industry plays a significant role in the development of the world economy. In today's America, for example, out of the 10 USD trillion revenues, the construction industry comprises about 3.6 trillion USD (Meron, 2020). According to World Economic Forum (2016), 6% of the world economy GDP comes from this sector. Another study by (Jekal 2004; Ofori, 2006 as cited in Mohamed, 2016) shows that the construction sector contributes to the socio economic aspect of emerging economies, and construction activities in those emerging economies are responsible for nearly 80% of the growth equity assets and 10% of Gross Domestic Product and over 50% of wealth invested in fixed assets, and this industry has been the major source of huge employment opportunities as well.

Ethiopia is the second populous country in Africa with about 110 million people, and it is one of the countries in the continent whose economy is growing fast. Its economic growth depends on different sector activities of which the construction industry is one. The GDP growth of the country in the year 2019 was 9.0 %, and the share of the construction industry embraces 19.5 % (Abebe, 2020). Abebe further notes that the construction industry plays an important role in the country's economy and an instance of this is that the industry creates employment opportunities for the citizen and thereby increases their income. As a result, it contributes to government revenue through generating corporate profit tax and employee's income tax which in turn goes to the finance used to construct infrastructure such as schools, health centers just to mention some (EEA, 2006, as cited in Abebe, 2020). According to him, a remarkable growth has been registered by this sector for more than a decade, and this has resulted in increase in the amount of investment and development of various infrastructure projects. Also, the construction industry has a great role in the development of social and economic activities of the country and it enhances the growth of other industries which improve the involvement of everyone's life

activities. Similarly, Ethiopia's construction industry is a huge investment sector, and its yearly average contribution to the capital budget has been 58-60% for the last many years. Regarding this, Wubshet(2004) states that there are currently various construction projects being undertaken by government and non-government organizations. Between years 1997/98 and 2001/02, an average annual rate of 58.2% of the capital budget of the country was consumed by public construction projects.

Addis Ababa is one of the cities in Africa which is growing fast, and the construction industry contributes vastly to its growth. The fact that it is the capital of the country and a seat for different international organizations adds meaningfully to its growth. The researcher's personal observation shows that there are various building construction projects being undertaken in different parts of the city. Obviously, this industry has created job opportunities for a good number of the citizens which inevitably contributes to the growth of national economy. In relation to this, Meron (2020) states that Addis Ababa is home for 25% of the country's urban population, and it is considered as an engine for the growth of the country and it plays a significant role to enable the country realize its vision to become a middle income, carbon-neutral, and resilient economy by 2025.

In recent years, due to its strategic importance, the city has been growing rapidly in terms of physical size and the size of its residents. As a result of its growth, about 46% of vacant and underutilized land has been occupied (Meron, 2020). Cognizant of the rapid growth of the city, the government is trying to take some significant urban measures in order to address the challenges the city is facing and thereby improve proper land use. Measures taken include encouraging urban innovation which targets projects that focus on constructing high rise buildings. These high rise buildings are expected to enhance proper land use as it minimize expansion to the peripheries, and also it contributes to efficient use of space for offices and apartments. Also, it is believed that the well thought plans and design could change the appearance of the city.

Construction projects, alike other projects are unique and carried out in a dynamic environment. Thus, they are exposed to risks, and these risks could arise from the challenges inherent in the industry. Regarding this, Mohamed (2016), states that the sector faces high levels of risk due to

the nature of the sector's business, chain of activities, external factors and firm's organizational structure. Similarly, Shofoluwe & Bogale (2010), as cited in Mohamed, 2016, notes that construction projects involve risks and uncertainties, regardless of size. But it is undeniable that the risk associated to a project is directly related to the size and complexity of a project. Thus, organizations are required to adopt and incorporate a risk management culture into their system in order to ensure effective and efficient performance in the project they run (Meron, 2020).

Project risk management (PRM) helps an organization have a structured framework to identify, assess, monitor, and control risks projects face (Lechler T.G, Edington B.H. & Gao T, 2012. Also, PRM is an important aspect that should be given emphasis during the course of a project. If risks are not managed properly, it is likely that they have adverse effect on performances and quality of the project, and they could expose the project to incurring additional cost and time. Regarding this, Wehrung et.al. (1988) and Al-Bahar and Crandall (1990) confirm that risks cause cost overrun and schedule delay in many projects. So, the effectiveness of risk management becomes an important aspect of project management, and to make risk management more efficient and effective, all parties must understand risk responsibilities, risk event conditions, risk reference, and risk management capabilities. Hence, there should be proper coordination and communication among the project stakeholders.

Projects are expected to apply systematic risk management practice based on best practices and modern risk management initiatives of related projects. Methods based exclusively on perception or ignoring the presence of risk in complex conditions in which projects are developed do not bring adequate management methods. Project risk management encompasses identifying influencing factors that could potentially negatively impact a project's cost schedule or quality baselines; quantifying the associated potential impact of the identified risk; and implementing measures to manage and mitigate the potential impact (Mills, 2001).

Regarding this, Oyegoke (2006) states that construction projects are unique and the source of risks they encounter could be different. The building construction, for example, is complex and demands highly sophisticated technologies and structures. Thus, they are challenged by uncertainty and risks. Risk management in construction project management context includes identification, assessment and prioritization of risks, monitoring, controlling and applying

managerial resources with a coordinated and economical manner to minimize the probability and impact of unfortunate events and to maximize the realization of project objectives (Douglas, 2009).

### **1.2 Statement of the Problem**

It is unlikely for construction projects to experience a zero risk, and risks are inherent in almost all construction activities. These risks usually affect the constraint factors namely time, budget and quality (Loosemore, 2006). By their very nature, construction projects are complex, and they are exposed to uncertainties. These risks and uncertainties may have positive or negative impact on project objectives.

To achieve project objectives with certain focus on time, cost, quality, environmental sustainability and safety, construction project risk management should be identified as an important element of the project work. However, different studies show that comprehensive and holistic approach to risk management, which targets identifying construction risks, the probability of their occurrence and the impact they have on project objectives is neglected (Abu Moussa, 2005).

Compared to other industries, the construction sector with its numerous activities is exposed to more risks and uncertainties. To deal with the risks encountered, some organizations have developed suitable risk handling techniques so that they can proactively manage risk associated with projects. But using risk management techniques is often uncommon in the construction industry and therefore not generally used. Risk is naturally part of all projects, irrespective of area of operation and magnitude of project. There is not any absolute risk free project, therefore if the risks are not carefully identified, properly analyzed and workable risk management strategies put in place, the likelihood of the project failure will be high (Mahindra et al., 2013).

By the same token, Banaitiene and Banaitis(2012), states that many construction projects fail to achieve their time, budget and quality goals. Further, the impact of risk in construction projects of developing countries, including sub-Saharan region are exposed to more severe risk than those countries in the western world (Kululanga and Kuotcha, 2010; and Wang and Aguria, 2004).

As mentioned above, risk and its management techniques often challenge actors in the construction industry. Thus, an effective risk assessment and management system is needed to help in the risk management process. Construction Risk management is presented to help in identifying project risks, systematically analyze them and use appropriate tools and techniques in managing them. Hence, in order to unravel project complexity and reduce construction risk, there is the need for systematic risk management (Al-Bahar, 1990).

The researcher had a chance to observe a number of building construction projects being implemented experiencing delay, and they are taking more cost than expected. Concerning this, Addis (2014) states that majority of building construction projects in Ethiopia are not completed in accordance with the plan set at the beginning. He further notes that stakeholders engaged in the construction industry usually encounter various challenges that could lead to schedule and budget overruns. It is mentioned by the same author that one of the reasons for these nonconformities of project objectives could be due to the fact that risks keep coming throughout the life of the construction project, and unless they are addressed properly, they inevitably affect project performance.

During the informal discussion the researcher had with some stakeholders who are currently implementing some of the building construction projects in Addis Ababa, they mentioned, particularly the project managers, that they have been challenged by delay of the construction work. They witnessed that the current inflation in the country might contribute to this, and as a result, the owners are unable to compete with the existing market situation. In addition, a study by Mitikie, et.al.(2017) shows that the impact of risk in Ethiopian construction project can originate from various factors among which equipment/materials failure, labor poor productivity, and scarcity of construction materials are the major ones that affect project performance highly. In the study, they revealed that the risk management is not practiced very well. Also, factors related to unforeseen site conditions, , incomplete contract documents,, and lack of timely decision making, and scope change are factors that affect the construction project performance (Andualem, 2020).

Therefore, this study seeks to identify what other risk are affecting the current building construction industry and evaluate their severity through an extensive study of literature and examine the risk management techniques and practices being used by the Contractors. The

researcher will attempt to consider some of the risk factors which were not dealt with in a comprehensive manner or otherwise not given much emphasis by previous authors. Some these factors could be the country's current political instability, increase of labor costs, increase of construction materials price, competency of contractors. Besides, the study tries to assess some preventative and remedial methods being employed by contractors and to what extent they use them in their regular project execution practices.

### 1.3 Research Questions

Taking the research problem into account, the study attempts to answer the following questions:

1. What are the risks that affect the building construction projects in Addis Ababa?
2. To what extent do these risks affect the Construction Industry?
3. What are the risk management techniques and practices being used by contractors to control the identified risks?

### 1.4 General objective

This study aims to assess the risk management practices of contractors in building construction project in Addis Ababa towards construction project risk factors.

#### 1.4.1 Specific Objectives:

The study tries to address the following specific objectives:

1. To identify risk factors that typically affect construction project in Addis Ababa;
2. To assess the severity of the identified risks on projects;
3. To identify the risk management techniques that are being practiced;

**Scope:** The scope of the study is limited to level one building contractors who currently running projects in the capital, Addis Ababa.

### 1.5 Significance of the study

Construction professionals often face critical issues in their risk management practices. Thus, various risk management practices are carried out as the project is being implemented. This study is expected to:

- provide knowledge on how to manage risks that construction projects encounter;
- help project managers and other professionals identify better ways to plan and execute projects through appropriate risk management tools;

- provide construction organizations with guidelines of best risk management practices;
- understand how the risk management practices of construction firms lead to the execution of projects;
- Help other actors in construction industry (namely clients, consultants, and subcontractors) gain knowledge on ideas about risk management of construction organizations or firms;
- benefit individuals in the academia(Lecturers and students of various tertiary institutions) where it can be used as a teaching and learning tool;
- Serve as a basis for further research into the subject area of risk and provides more insight into the risk management practices of construction industry.

## **CHAPTER TWO**

### **2. Review of Related Literature**

#### **2.1 Introduction**

In this chapter, the relevant literature related to risk in construction building projects is discussed. Also, some aspects of project management and risk management are addressed. The chapter also deals with how the project stakeholders, particularly contractors are able to identify, mitigate and avoid risks in construction projects.

#### **2.2 Overview of building construction and its role**

The construction sector plays a paramount role in economic activities of many countries. A study by (Ofori, 2006), for example, states that the construction industry is a crucial component of the economy of most countries. In developing economies, activities related to construction are responsible for about eighty percent (80%) of gross equity assets, ten percent (10%) of Gross Domestic Product and over fifty percent (50%) of wealth invested in fixed assets. Undoubtedly, next to agriculture, the construction sector has been a major source of massive employment opportunities (Jekale, 2004).

The work of Addis (2014) also confirms the significant role a construction sector plays. According to him, construction projects involve use of capital, experts and material resources in a way they serve the needs and intention of the client, and thereby contribute to the development of a country's economy by producing outputs, creating employment opportunities, and generating income. Besides, construction projects play a role in providing and satisfying the basic needs such as housing, infrastructure and consumer goods (Ibid).

##### **2.2.1 Overview of construction projects in Ethiopia**

Ethiopia is one of the countries in the world whose economy is growing rapidly. It is believed that the construction sector is among those sectors that have significant contributions for the overall growth of the economy and citizen's better life. Apart from this, the sector opens doors for Ethiopian professionals who engaged in the field, and it helps them generate income and thereby improve their experience in the industry. According to Alem(2020), "the construction sector could enhance the ability and effectiveness of the indigenous contractors, consultants and

informal sectors”. Regarding the significance of the sector, the Construction Industry in Ethiopian (2018) states that the construction sector invites construction firms which with their various technologies and practices. Activities in construction sector have encouraged public and personal expenditure to invest on construction work, and this in turn impacts the country’s fast growing economy positively. The investment in construction sector exceeds 30% of GDP into Gross Fixed Capital Formation (GFCF) expenditure beginning 2010(Ibid).

Also, other sources have a similar view about the role construction industry in Ethiopia. For example, the African Economic Outlook (AEO, 2017), asserts that the construction activities in Ethiopia accounted for 15.9% of GDP in the year 2015/16.

Despite the positive economic impact the construction projects have, the practice of risk management in construction projects is believed to be at its infant stage. Regarding this, Alem(2020), citing Yimam(2011), argues that the maturity of the construction project management experience is at the casual development maturity phase. Various studies confirm the fact that the risk management system in construction projects is below the maturity level expected of it. Alem(2020) , for example, confirms that construction projects require risk and safety systems put in place; however, people who run construction projects( about 2/3 of contractors for instance) rarely have risk management practice, and 24% of them demonstrated poor risk management skills.

From the above findings, it can be deduced that risk management seemingly got very low level of attention. This might show the level of attitude, perception, awareness and significance towards risk management by the practitioners in the building construction industry of the country.

### **2.3 Overview of projects and project Life cycle**

By its very nature, a project is different from business-as- usual activity for a project has final deliverables and finite timespan unlike management which is an ongoing process. Project management is a non- permanent endeavor implemented to bring a specific outcome of product, service, or results. It has its own features such as specific objectives, constraints (like time, budget, desired performance criteria time constraints, and participation of various sectors and professionals. Concerning this, Kerzner(2001) states that a project has a chain of activities with a

beginning and an end date that achieves specified objectives to be realized under the constraint of time, cost, and resources.

Project management intends to produce an end product that will effect some change for the use of the organization that initiated the project. Thus, it should undergo different stages so as to deliver the intended result or the end product. According to PMI (2004), the following are the stages it undergoes and their brief explanations:

### **Initiation:**

At this stage, the project looks into some consideration such as environment and integrates the required resources through preliminary scope statement. Also, it encompasses the basic constraints vis-à-vis time (schedule), cost and activities. Besides, it considers contract agreement documents, list of necessary equipment and the budget required for the project.

### **Planning and design:**

This is the stage where the management of the project through the forthcoming stages is captured and shown. In planning and design stage tasks and activities are defined, the sequence of the operations is identified, and the resources required for different activities are determined. It also makes sure whether the project addresses the needs of beneficiaries within the allocated limited constraints of the project, for example time and budget.

### **Execution:**

The actual implementation of the project begins here. The planned activities and tasks which were defined already are done to realize the desired project objectives. This stage usually demands the collaboration of project team and proper resources that help achieve the outcomes set at the beginning.

At this phase of the project, a kick off meeting should be held to mark:

- the introduction of who is who;
- project background and the location of the project;
- what the goals are;
- project scope, what exactly is the focus of the project;

- the kind of work involved;
- project plan;
- roles-who will be responsible for which project elements;
- Communication-what kind of communication channels will be used;
- what kind of report should the team expect;
- **Tools**- what tools will be used to complete the project and how they will be used.

### **Monitoring and controlling:**

It is through monitoring and controlling that responsible project team members track progresses made and challenges encountered during the course of the project. Apart from identifying progresses and challenges, in this stage, potential solutions are forwarded for the problems identified. At this stage, we consider activities are still being carried out, the actual cost required to implement the project, if the time allocated for individual activities and tasks is of the appropriate one, and whether the anticipated output is realized as per the project plan. In general, this is the stage where we thoroughly examine the overall performance of the project, assess risks and take remedial actions.

Also, an online source (<https://youtu.be/TjYIEPk1yvQ?t=63>), Substantiates the above claims saying that monitoring and control is the phase of the project where we check if things are moving in the right direction and a coordinated manner, if adjustments to the project plan need to be made due to unforeseen circumstances or change in direction. The source further states that during monitoring and controlling, the project manager does the following:

- Manage resources;
- Monitor project performance;
- Risk management;
- Perform status meeting and reports;
- Update project schedule and modify project plan.

### **Closing:**

This is the stage where project completion is announced, and the process of handing over the project to the client is done. The contract pertinent to the project is cleared and closed out.

Regarding closing a project, PMBOK Guide (2017) states that, when closing a project, “the project manager reviews the project plan to ensure that the project is completed and the project has met its objectives”. It further notes that the activities necessary for the project close out could incorporate:

- Making certain that all documents and deliverables are up-to-date and that all issues are resolved;
- Confirming the delivery and formal acceptance of deliverables by the customer;
- Ensuring that all costs are charged to the project;
- Closing project accounts;
- Reassigning personnel;
- Dealing with excess project material;
- Reallocating project facilities, equipment, and other resources; and
- Elaborating the final project reports as required by organizational policies.

### **2.3.1 Construction Project**

A construction project could refer to the different construction activities that are undertaken by government or non-government organizations. Some of these could be the construction of roads, bridges, dams, commercial buildings, and housing projects. When it comes to the conceptual explanation of it, Levy (2000) defines it as a physical structure that is instigated by designers, drawings, and changes it into a finished product using various methods and processes. Before the execution phase of the construction project begins, basic planning work including allocating budget and fixing time frame together with other relevant resources should be well thought out. Levy added that, in order to make construction projects successful and achieve the intended objectives, it has to be completed within time, budget, and issues related to claims and disputes that might arise during or after the project should be resolved. Besides, the rapport that exists between contractors and other pertinent stakeholders is crucial in achieving the desired outcome.

Construction project is run by different stakeholders. Altoryman(2014) describes the following as the main actors(stakeholders) who play crucial roles in carrying out the construction project work:

**Clients:** Clients are stakeholders who serve, as financial resources required for the work of construction projects. The clients expect the project to be completed in the range of estimated cost and time set during planning.

**Consultants:** They are usually selected by the clients and their main role is representing and protecting the interest and advantage of the client. They usually provide consultancy service based on the request made by the client, and when they find it important. The advice they render incorporate risks that might arise as a result of inappropriate project implementation practices and which could, for example, result in claims and disputes. Consultants are expected to have the necessary knowledge, skills and professional expertise. They could comprise a group of designers, project managers as well as engineers who specialized in the field.

**Contractors:** It is not enough to have a well-designed construction project. It requires execution by relevant professionals. Thus, contractors are the ones responsible, mainly, for executing the work of designers, and their responsibility could embrace building different forms of a construction and try to maximize profit from the project they implement. Contractors could exist as **main contractors, sub-contractors, and suppliers.**

Contractors, like other professionals, should possess the relevant knowledge and skills that are required to execute the project within estimated budget, time, resources and quality in accordance with the specification set at the beginning. However, often times, inability of contractors in achieving project objectives leads to mismanagement practices (Flanagan, 2006). Contractors are expected to make sure that if claims and disputes are resolved early. If not resolved in the soonest time possible, the likelihood of project delay will be high, and this in turn affects the progress the contractor makes (Brimah and Ndekugri, 2008). As a construction project is complex in nature, it demands proper attention. Therefore, the client's selection of contractors determines the management of the project. In addition, I clients decide if a consultant or a contractor is capable enough and could take the responsibility to manage the work of the construction project (Gloud, 1997).

## 2.4 Project Management

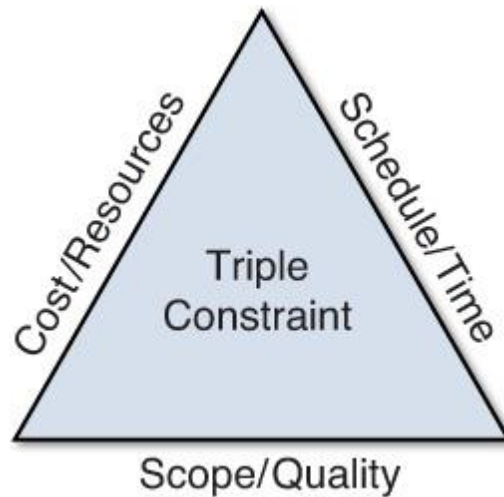
Alike many other projects, it is inevitable that construction projects experience some level risk, mainly related to basic triple constraints such as cost, time and resources. Hence, putting a project management system in place is important.

### 2.4.1 Definition of project management

According to PMI(2004) project management refers to the application of processes, methods, skills, knowledge and experience to achieve specific objectives based on the project acceptance criteria within agreed parameters. APM further explains that project management is expected to deliver final product within a finite time frame and budget allocated. Project management is different from ‘management’ in that it delivers a final product in a definite timespan, as opposed to ‘management’ which is an ongoing process. Due to the demanding nature of projects, people who manage them need to have a wide range of skills, basically technical skills, people management skills and good business awareness (Ibid).

As for PMI(2004), project management is defined as, “the art of directing and coordinating human and resources through the life of a project by using modern management techniques to achieve pre-determined goals of scope, cost, time and quality and participants satisfaction”. There could be many factors that affect the progress and achievement of a project, but the triple constraints namely time duration, budgeted cost and the scope of the project significantly stands out most.

Similarly, Wilson (2015) substantiates the above views saying “projects would inherently have three primary components: an output deliverable (scope/quality), time frame (schedule/time), and budget (cost/resources), commonly referred to in project management as the Triple Constraint ,



**Figure 1 Triple constraints**

**Source: Wilson, 2015**

Project management is such an important concept which project stakeholders, particularly, project managers and contractors should give proper focus to.

#### **2.4.2 The importance of project management**

According to APM (7<sup>th</sup> ed.), Project management targets delivering an end product that will effect some change for the benefit of the organization that instigated the project.

Thus, investment in effective project management will have benefits such as:

- providing a greater likelihood of achieving the desired result;
- ensuring efficient and best value use of resources;
- Satisfying the differing needs of the project's stakeholders.

#### **2.5 Project management processes**

Various projects may demand different resources based on their nature of complexity. So, the project manager is expected to handle the project work by breaking down the components into their manageable parts. Regarding this, Hilson(2002) states that a system approach is needed to address the distinct elements of a project. In order to manage the elements, the 10 project management areas(project Integration Management, Project Scope Management, Project Time Management, Project Cost management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management and Project Stakeholders Management ) play a paramount role. In

other words, these areas contribute significantly for the successful completion of a project. However, this study focuses mainly on risk management and its sub-components and their role in project implementation, particularly in construction sector. Hence, risks in construction projects are discussed in detail in the subsequent pages.

## **2.6 Risk Overview**

It is unlikely for projects to experience a zero risk; they are exposed to certain level of risk. According to PMBK Guide (2017), all projects are risky as they are unique undertaking with varying degrees of complexity that intends to deliver benefits. They do this in a context of constraints and assumptions while responding to stakeholder expectations that may be conflicting and changing. Thus, organizations are required to consider project risk in a controlled and intentional manner, so that they could create value while balancing risk and reward.

### **2.6.1 Conceptual Definition of Project Risk**

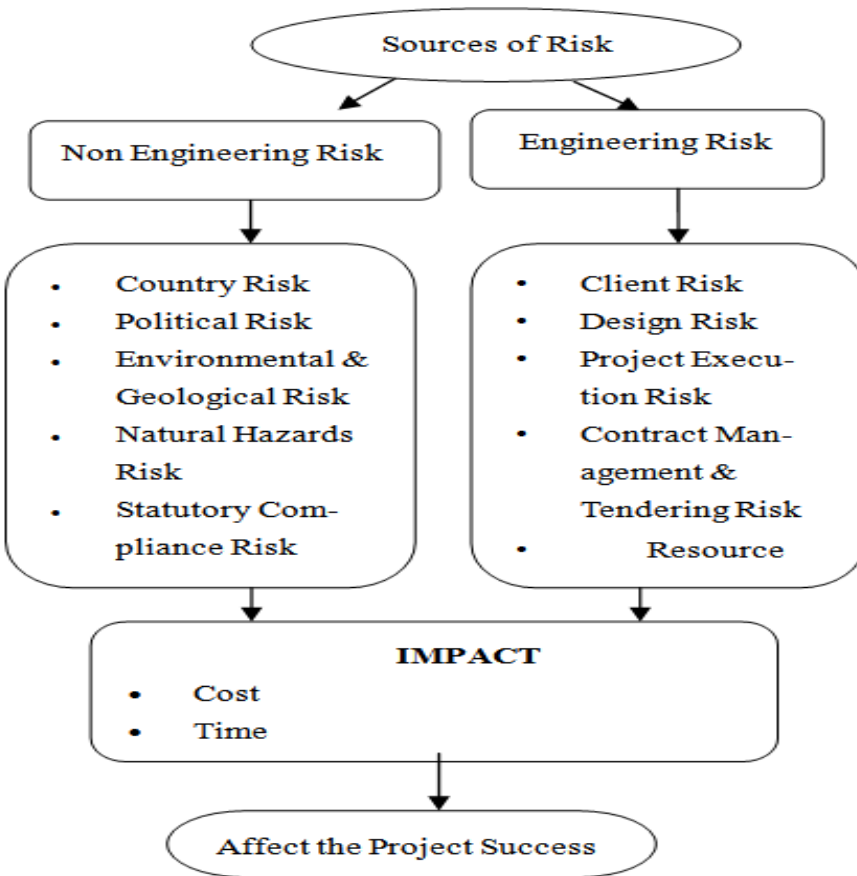
Many agree that the definition of risk is related to project objectives. Hilson(2002) , for instance, defines risk simply as, “uncertainty that matters”, and it matters because it affects one or more project objectives. “Risk does not exist in a vacuum”, so it is important to define what objectives would be affected if it occurred. Hilson tries to further define it as: “risk is an uncertainty that if it occurs could affect one or more objectives”. This implies that not all uncertainties are relevant to objectives. Therefore, only those that affect are included in the risk management process. The next example could clarify the concept more. If a project team is conducting an IT project in one of the regions in Ethiopia (for example, Amhara), the uncertainty about if it might be raining tomorrow in Addis is irrelevant. But if the project involves working on a palace garden in Addis, the possibility of rain in Addis is considered as uncertainty that matters. In this case, the rain is a risk for it can affect the outcome of what is being done in Addis, palace garden.

With this understanding of what a risk is, let us now proceed to the next important topic, which is project risk management process.

### **2.6.2 Sources of Risk**

As every project has a unique nature, the sources of risks are also unique. Thus, it is important to consider if the different sources of risks are pertinent to the individual projects undertaken. Mohammed (2016) substantiates this view saying that “the sources of risks are unique to individual projects and it is commonly related to all projects”. Consequently, in construction

project, risks could arise from various sources. As mentioned by Wales (2001) the following are the major risk sources in construction projects. These are: Environmental risks, political risks, Social risks, financial risk, Legal risks, Technological risk, Commercial risks, Communication risks, Geographical risks, Management risks, Geotechnical risks, construction risks, and demand product risks.



**Figure 2: sources of risk**

**Source: Renuka et al., (2014)**

It is recognized that those risk factors categorized as engineering risks are usually considered to be predictable, whereas those grouped under non engineering cannot be predicted. Hence, the ones that belong to engineering factor can be forecast at the beginning of the project. On the other hand, the non-engineering ones could involve uncertainties and can affect the cost, time

and quality of the project which ultimately can affect the achievement of project goals. Therefore, they should be identified, analyzed and estimated.

### 2.6.3 Risk Factors in Building construction projects in Ethiopia

#### 2.6.3.1 Classification of Risk

As one can see from the aforementioned pages, there are various sources for project risks, and risks can be classified and categorized into their respective categories. But it is worth explaining what a risk classification is. According to PMI (2008), risk classification is a system that shows a comprehensive process of risk identification and how it contributes to the quality and effectiveness of the risk identification process. Researchers, based on the nature of risk, classify risks into different categories. Accordingly, the classification encompasses contractual, legal, construction, political, management, physical, environmental, design, financial, natural hazards, safety and delay risk (Mustafa, 1991; Akincl et al., 1998; Prasanta Kumar Dey, 2002; Ghosh et al., 2004; Wiguna and Scott, 2005; Enshasi and Mosa, 2008; Wang et al., 2010; Razakhani, 2012; Goh et al., 2013 cited in Renuka et al., 2014).

There are many factors that contribute to construction projects risks. Most of these risks could exist as external and internal factors. Each of them will be discussed as follows:

#### External Factors of risks-unpredictable

These are risks that are usually considered as risks that are beyond the control of the project team (Andualem, 2020). The external factor comprises different components which potentially affect the implementation of construction project objectives. Mohammed (2016) states the sub-components/elements of external risks as: Financial, economic, government, environmental, and technical risk factors. It is now worth explaining these factors and each of them are discussed briefly in the subsequent pages:

**Financial:** this usually relates to financial failure and delay in payments, and it is inevitable that such challenges could significantly affect the process the project expected to make.

Regarding this, Berko(2007) confirms that contractors usually complain as a result of delay in payments due to malfunctioning bureaucratic systems in government offices and agencies. He also notes that the delay in payment could hamper the progress of projects.

**Economic Risk Factor:** Construction projects can be affected by poor financial markets, inflation and mounting price (Mohammed, 2016). These elements have a direct impact on project progress which might lead to overrunning. Regarding this, Agyakwa-Baah,(2007); Denini, 2009) explain that “currency instability could result in cost overrun mainly because of inflation”. The researcher has a first hand experience about the current financial trends and purchasing power of money in Ethiopia. The exchange rates, scarcity of material supply, fiscal policies and inflation, similar pattern when it comes

Poor financial markets, inflation and price hiking are among the variables associated with economic risk drivers which have a direct consequence on projects’ overrunning (Agyakwa-Baah, 2007; Denini, 2009). Currency instability may result in cost overruns mainly because of inflation. Edwards and Bowen (1998), identified economic risks in Ghana as exchange rates, material supply, labour supply, fiscal policies and inflation are some of the factors should be considered. Frimpong *et al.* (2003) position themselves saying, the rise in inflation should also be considered in risk studies.

Also, financial risk concerns with the ability to overcome the financial risk of a project through to final completion and operation. This risk factor involves issues or concerns associated with the financing of the project, including the execution period and operations or equity financing (Jayasudha and Vidivelli, 2016),

**Environmental risk factors:** They are significant determinants of the success and failure of a project. This incorporates factors associated with local weather and climate extremes, geotechnical and topographical issues, site access constraints, utilities and local service availability, environmental sensitivities and human and material resources availability (Management of project risks, <https://youtu.be/TjYIEPk1yvQ?t=63>). To ensure effective project risk management, it is paramount to understand the project environment and its contextual factors. De la Cruz *et al.* (2006) opined that, any time risk factors are to be considered, events such as the conditions of the ground and likely contaminants and site conditions should be noted as well as time restrictions imposed on the project by the client.

**Political risk:** As stated in the study conducted by Addis (2014), construction projects could be affected by the role the host country plays. For example, there are times when the construction is on the host government's site/ country, and in this case, the host country might interfere in the bidding and the construction process. This could happen by changing laws and standards. Thus, the contractor needs a secure environment to perform the construction and should be clearly stated in the bid as well as the contract document.

Jayasudha and Vidivelli(2016), explains political risk as the ability to overcome the political risks of the project, including local, state, and national political oppositions and code and regulatory impediments. This risk factor involves issues or concerns associated with the local, regional and national political and regulatory situation confronting the project.

**legal risks:** usually legal risks refer to those risk that appear during the construction phase of the project. Delayed disputes have huge impact on the progress of the project and this incur additional time and cost which eventually affect the objective of the projects.

**Technical risk factors:** These are risks arising directly from the technology of the project work, of the design, construction or operation of the facility.

#### **Internal risk factors:**

Internal risks are risks that consist of uncertainties which arise from within the project (Andualem, 2020). Some of the internal factors could originate from inadequate and faulty plants and equipment, and these are influential problems in construction firms (Berko, 2007). Besides, scarcity of materials, malfunctioning tools, lack of proper skills and technical expertise to operate on plant and equipment, and the poor performance of labor the main internal factors identified as the risks majority of local contractors are experiencing (Berko, 2007; Agyakwa-Baah, 2009).

Below are the common internal factors construction project contractors encounter.

**Design risk:** One of the most important requirements to minimize time delay and cost overrun is the allocation of sufficient time and money at the design phase (Koushki et al., 2005). Design is

one of the most critical categories because its related factors were identified as key risks in construction projects (Fereig and Kartam, 2006).

**Construction risk:** Construction risks usually come from risks factors such as rush bidding, unrealistic project schedule, undocumented change order, lower quality of work and changes in design.

**Technical risks:** This is ability to overcome the technological risks of a project. And this risk factor involves issues or concerns associated with the technologies involved in the execution methods and operational technology of the project (Jayasudha and Vidivelli, 2016),

**Management risk:** In project management there are two major aspects: the art and the science of the project. The art deals with the people involved in the project, while the science deals with defining and coordinating the work to be done; for example, it involves the knowledge, understanding, and skillful application of a project management process (Heerkens, 2001)

### **Risk Management in Construction projects in Ethiopia (Literature review)**

Construction industry is one of the vibrant sectors and it has been contributing significantly to the economic development of Ethiopia. For instance, a study by the Construction Industry in Ethiopia (2018) depicts that this sector improved the capacity and effectiveness of local constructing firms such as contractors, consultants and informal sectors. The same source confirms that indigenous corporations participate in formal construction activities, and this in turn adds value to their effort to know more about various foreign technologies and construction firms. As a result, there is obvious improvement in public and personal expenditure on infrastructure and various constructions works which ultimately are used as a catalyst for the country's fast economic development. Since 2010, there has been a visible investment activity which accounts for more than 30% of GDP into Growth Fixed Capital (GFCF) expenditure (Ibid).

Despite such significant contribution in the country's economy, a risk management practice in construction project is at its infant stage (Alem, 2020). Alem further notes that, in Ethiopia, the construction projects risk management system requires more work to bring it to certain level of maturity. Also, a study by Yimam(2011), with particular reference to contractors, affirms that

the maturity of the management of construction projects, general terms, is below the level required of it. It is assumed that the fact that a relatively newness of the construction industry in Ethiopia could contribute to the immaturity of project management in general and project risk management in particular..

Various findings witness that risk and safety management practices are the ones, among project management knowledge areas, given the least attention. Alem(2020), for example, argues that these two areas are unfamiliar or otherwise practiced rarely in construction projects. According to him, nearly 2/3 of contractors seldom have risk management practice. Besides, Alem notes that approximately 24% of contractors perform risk management poorly. According to Yimam(2011), among the 21 contractors he used in his study, only two of them practice risk management somewhat properly. He asserts that about 38% of the respondents ‘identified and documented’ risks and 33% assumed they implemented some examination to the probability and effect.

From the aforementioned evidences about risk management practices by contractors, one could deduce that risk management practices in construction projects are not given proper attention. This could be due to the fact that contractors lack adequate knowledge and skills in managing project risks, they might have not developed the right perception about risks, or they might think that risks are not as important as the other components used to run projects, or they don’t have the right attitude.

Project risk management entails potential risks, analyzing the risk, and taking proper precautions to reduce or curb the risk. The occurrence of threats in any project can positively or negatively affect objectives. A risk is a deviation of uncertainty that may result in undesirable outcomes. In project management context, if these risks become realities, they are considered as “issues “that must be addressed (<https://youtu.be/TjYIEPk1yvQ?t=63>).

To prevent any loss or disturbance, it becomes an integral part of every project manager’s job to have a proper risk management plan. Risks may arise at any point in project lifecycle.

Hence, the team should ensure that the project remains on track and meets its goal by undertaking appropriate risk management throughout the project lifecycle

### **The Importance of Project Risk Management**

As mentioned earlier, project risk management helps predict and mitigate the risks which can affect the achievement of the project objectives. An online source (<https://youtu.be/TjYIEPk1yvQ?t=63>) discusses the main purpose of having project risk management. This explained in the table below:

<b>Importance of project risk management</b>	<b>Description</b>
<b>Evaluate problem areas</b>	A detailed project risk management plan should present a clear picture of the project and its problematic areas. This will enable the team to focus on the weak areas of the project performance, health checks, audits, and peer reviews to enhance the project performance.
<b>fewer surprises</b>	A risk management plans will give the team an early warning of potential risks or issues. This will enable the team to be proactive and take the necessary steps to mitigate problems before they escalate to severe problems and cause any irreversible harm.
<b>enhance communication</b>	Effective risk management enhances the flow of communication. The risks were detected beforehand to open the discussion point between the team involved, the team members should brainstorm on problematic areas and address the causes rather than blaming each other after the harm has been done.
<b>accurate budget estimation</b>	With project risk management mapped into the schedule and cost planning, the team can predict the problematic situations. This will help the team set aside a better budget for each phase to prevent waste and improve the project performance.
<b>focused teams</b>	Knowing that the project risks are monitored by the risk management unit of the project team, other units of the project team can focus on their assigned tasks.

<b>better decision making</b>	With information on risks in advance, the upper management can make better and more efficient decisions.
<b>elevated project success rate</b>	An effective risk management plan incorporated in the project management will boost the entire team's mindset.
<b>clear risk escalation</b>	A systematic risk management plan will give the team a good idea of when risk should be escalated to the senior level for advice and action help alert the right people to analyze and fix the risk at the right time.

**Table 1: Management of project risks**

(Management of project risks, <https://youtu.be/TjYIEPk1yvQ?t=63>).

### 2.6.5 Project Risk Management Process

It is unlikely to avoid risks totally; however, it is possible to minimize them if the risk management system is put in place. Many people usually incline to use their intuitive understandings, experiences, and judgments and make decisions in the construction projects they run (Alem, 2020). However, it is mentioned in the work of Flanagan et.al (2006) that the construction project involves a set of non-repetitive activities with unique specifications such as long term period, complex processes, and unfavorable environment, financial issues, and dynamic structure.

Thus, a systematic risk management process which includes identifying, analyzing, and responding, and monitoring risks in construction projects is crucial. Each of these processes will be discussed in the subsequent pages:

#### 2.6.5.1 Risk Identification

Risk identification is the first step of risk management process whereby events that could potentially affect the project (in this case, the construction project) objectives are identified. In other words, events that affect the achievement of objectives and bring negative consequences are risks (Mohammed, 2006).

According to **PMBOK Guide (2017)**, risk identification is the process of identifying individual project risks and sources overall project risk, and documenting their characteristics. Risk identification is not a one-time thing; it is assessed on a continual basis throughout the life of the project (PMI 1996). Risk identification focuses on risks that affect the project objective not only positively but also those risks that might have negative consequences on the project. Therefore, in the process of risk identification, it is important to determine risks that are likely to happen and have either outcome, positive (opportunities) or negative (threats), so that proper action is taken accordingly. Regarding this, PMI (1996) states that in every project context, risk identification is concerned with not only on positive outcomes or opportunities but also the negative outcomes or threats. From what is explained here, it is sensible to say failure to identify potential risks/hazards might lead to delays or cost overruns.

Risk identification is the first step of risk management processes by which potential risks relevant to a construction project are identified, and this process considers different sources. According to Andualem(2020) , there are two sources from where various risks could originate. These are internal and external risks. Uncertainties that exist outside of the organization (project team) are external risk, and those that prevail within the project are categorized as internal risks. Scholars who carried out their studies on risk management tried to categorize the different component of the two. In the works of Chen *et al.* (2004); Ruqaya *et al.*2012; Tumi *et. al.* (2009); Sweis *et. al.* (2008); Markmann *et al.* (2013); Assaf and Al-Hejji (2006); Shen (2001), and Koushki *et. al.* (2005), it is identified that external risks that are beyond the control of the project team could be **political, economic, legal, social, and nature** risks; whereas risks that exist within the scope of the project team are those related to **design, construction, financial, management** and **maintenance** risks. Each of these risks will be discussed in a more detailed manner later.

The project team is expected to take a good amount of time during risk identification process and identify the potential risks. An online source (<https://youtu.be/TjYIEPk1yvQ?t=63>) states the role of the project team here. It explains that the team should:

- brainstorm on all potential risk including threats and opportunities;
- create a list of potential risks to the project;
- determine probability-what is the possibility that the risk will occur,

- determine the probability-high, medium or low probability;
- Determine impact-what would happen if each risk occurred?
- What would happen if the final delivery date postponed or extended?
- What if the project amount would exceed the budget?
- Identify which project risks significantly affect the project's outcomes and rate them as high impacts, rate them medium or low risks.

### 2.6.5.2 Risk Analysis

According to Glossary of Project Management(2019 ), risk analysis is an assessment and synthesis of estimating uncertainty and/or specific risk events to gain an understanding of their individual significance and /or their combined impact on objectives.

Risk analysis is a crucial component of risk management processes. Lavanya, N. & Malarvizhi, T. (2008) explains that risk analysis involves examining how project outcomes and objectives might change due to the impact of the risk event. Once the risks are identified, they are analyzed to identify the qualitative and quantitative impact of the risk on the project so that appropriate steps can be taken to mitigate them. Analyzing the identified risks is the main focus of risk analysis. It begins with assessing the impact risks have on time and cost, and their economic processes or parameters of their respective effects could be analyzed and three generalized kinds of risk treatment can be applied (Mohammed, 2006

Having clear vision of risks helps the project team apply the best data available in a systematic and structured manner, instead of managing intuitively alone. Such practice enhances the effects of uncertainties and creates the chance to understand the project more thoroughly. Jaafari(2001) explains that risk analysis is not a onetime activity, it is a process made continually to respond to project dynamics. In other words, risk analysis indicates what will happen if the project is not being accomplished as per the plan (Flanagan & Norman, 1993).

### 2.6.5.2 Risk Analysis and Techniques

The magnitude of the identified risks should be analyzed properly so that proper action will be taken and the project will achieve the intended objectives. For Mlybari(2011), the intention of conducting risk analysis is to understand and quantify the likelihood and impact a risk has on a project. There are two approaches by which risk analysis is handled. These are: qualitative and quantitative forms of risk analysis. Each approach will be discussed briefly as follows:

#### Qualitative Analysis

It is used to explain and recognize individual risk and to provide information on to what extent the risk affects the project, usually expressed using qualitative/descriptive measure such as high, medium and low(Mlybari, 2011). The benefit of qualitative analysis is that it is easy to obtain information and the analysis of it can be handled swiftly. Wilson (2015) confirms that the benefit of a qualitative analysis is that subjective assessments can be quickly obtained in reviewing work activity information and can be easily categorized. He further notes that project managers, when they review information gathered, must ascertain the significance of the activity in relation to the overall project.

Qualitative risk analysis used a matrix to analyze and prioritize, and determine which risks need further analysis and which should require an immediate response plan.

As mentioned by Wilson (2015), the qualitative risk assessment matrix is exchangeably used with **probability and impact matrix**. This is a tool that effectively analyzes risk. Here risks are compared one another and periodization is accomplished accordingly. The matrix employs a qualitative assessment of both probability and impact in terms of low, medium and high (Ibid).

A further explanation is given on how probability and impact of a risk. For example, Banaitiene and Banaitis(2012) states that qualitative analysis evaluates the effect and probability of identified risks and advances ranked lists of the risks for additional examination or immediate response actions. Various principles are applied to decide if the risk level is high or low, and this could be the likelihood of an unwanted event, the level of importance, and the successive effect of the risk if it does happen.

A sample for the probability/impact risk rating matrix is shown in the following table: -

**Figure 3: Probability /Impact risk rating matrix**

Impact	0.9	0.9	1.8	2.7	3.6	4.5	Very high
	0.5	0.7	1.4	2.1	2.8	3.5	High
	0.5	0.5	1.0	1.5	2.0	2.5	Medium
	0.3	0.3	0.6	0.9	1.2	1.5	Low
	0.1	0.1	0.2	0.3	0.4	0.5	Very low
		1	2	3	4	5	
		Very low	Low	Medium	High	Very high	
		Probability					

**Source: (John & Herman, 2011)**

### Quantitative Risk Analysis

The PMBOK Guide (2017) describes quantitative risk analysis as the process of statistically examining the likelihood that the project will encounter the budget and schedule purposes. Besides, Wilson (2015) explains quantitative risk analysis as it is a much more detailed and objective, and often results in percentages or other numerical values to describe risk assessment. Wilson further notes that if this level of information is available, it is advisable to use a quantitative assessment, because it allows more accurate assessment and effective response planning of budgetary and schedule impact in terms of measurable values. This type of analysis requires various tools that are capable of processing numerical values and output objectively, and absolute values describing risk probability, severity, and specific impact.

There are many methods used in quantitative risk analysis. The common ones are explained in the works of Ceric (2003), and Wilson (2015). Here are four of them:

### **1. Simple Assessment**

This method employs simple arithmetical way that addresses significant risks separately and examines the potential total effect. According to Ceric (2003), the evaluation is based on calculating the expected impact of every significant risk which is then added up, and the sum impact is used as the foundation for a contingency plan.

### **2. Sensitivity Analysis:**

Another way (tool) used to analyze risk is the sensitivity analysis. It studies the impact risks can have on a project. Wilson (2015) the project manager might have several identified risks, but to help prioritize these risks based on the relative impact they could have on areas such as quality of the output deliverables, budget, and schedule, the sensitivity analysis is done by the project team, particularly by the manager.

### **3. Probability Analysis**

This is a statistical method that enables calculating the exposure for every individual risk or for the project as a whole (as Powell (1996) cited in Mohammed, 2016). Here the first optimistic, most probable and pessimistic cost and time estimates are given for every event. An example is cited in the work Ceric(2003), an optimistic price estimate for building a block of flats may be \$500/m<sup>2</sup>, construction will most probably cost \$ 750/m<sup>2</sup>, and the pessimistic price estimate is 1000/m<sup>2</sup>. Then the probability for each evaluation is subjectively defined such as 0,3 for optimistic evaluation, 0,6 for for most probable evaluation and 0.1 for pessimistic evaluation. It is important for the sum of all the probabilities to equal 1. Then, multiplying the estimated construction costs with the 33 corresponding probabilities and adding up the products gives the exposure, i.e. the Expected Value (EV).

Thus,  $EV = (500 \cdot 0.3) + (750 \cdot 0.6) + (1,000 \cdot 0.1) = N700/m^2$ .

The EV differs from the optimistic evaluation by N200/m<sup>2</sup>, from the most probable by N50/m<sup>2</sup>,

and from the pessimistic evaluation by N350/m2. This means that the pessimistic evaluation represents the maximum likely risk and serves as the basis for making the contingency plan. Thus, probability analysis is simple to use and very understandable, but subjective evaluation makes it dependent on the experience and knowledge of the risk manager who makes it (Ceric, 2003)

#### **4. Decision Tree Analysis**

Here decisions are made when there are several alternatives, and when each of the alternatives has sub-alternative, and also each sub-alternative has another sub-sub-alternative (Ceric, 2003). Then, this forms a structure of a tree which shows all possible paths of decision. Wilson (2015) states the decision tree analysis can be used in analyzing a range of monetary or schedule impacts that differs severities of risk could have .He adds that as each response may have different values of improvement, the decision tree analysis can evaluate each scenario and drive an expected Monetary value (EMV) to better understand the cost of a risk as a function of its probability of occurrence.

#### **5. Monte Carlo Simulation**

Monte Carlo simulation is a computerized mathematical technique that allows people to account for risk in quantitative analysis and decision making. It helps the decision maker with range possible outcomes and the probabilities they will occur for any choice of action. It shows the extreme possibilities along with possible consequences. Wilson(2015) states that project managers use this technique when they want to calculate the probability of a risk occurring. Wilson mentions that the simulation is designed to use information relative to a specific risk that can be characterized over a range of variables that then be generated using a sensitivity analysis software tool. Limit values must be determined that specify minimum and maximum values used in setting the boundaries or the scope of the analysis. A range of estimates characterizing probability is also needed and can be generated via the triangular distribution tool.

#### **2.6.5.3 Risk Response Processes**

Risk response is the process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks (PMBOK

Guide, 2017). It is an action or set of actions to reduce the probability or impact of a threat, or to increase the probability or impact of an opportunity.

During the course of a project, particularly when work activities are underway, the chance of problems to occur is high and the project manager or the project team should respond. Actions are taken through having anticipated and documented planned responses (Wilson, 2015). He further notes that the execution stage of a project can be a busy and stressful time for the project team, however spending quality time identifying and planning responses for risk will prove valuable. Thus, it is crucial the project team should carefully anticipate identified risks and insure work activities are being done properly to reduce the chance of problems occurring.

Usually, there are two options or 'response modes' the project manager or project team can operate under: reactive or proactive. Reactive response mode refers to a situation when the project team does not have enough time and resources for proper risk identification and planning. As a result, it is difficult for the team to This could lead to unexpected problems and they are forced to use reactive mode of risk response, and the consequence of it leads to either cost overrun, schedule delays or a compromised deliverable. In Proactive response mode, on the other hand, the project manager has identified as many risks as possible and he should have response plans in place. In relation to this, Wilson (2005) states that the most powerful tools a project manager can own to manage projects is having information that informs him of what is planned as well as what is actually happening on work activities. Projects produce deliverables that meet the required quality, budget and schedule through eliminating as much uncertainty as possible and lead to achieving project objectives successfully.

### **Negative Risks**

It is not uncommon that projects experience both negative and positive risks. The purpose of having risk response strategies is, therefore, to avoid risks and minimize the negative impact they might have on a project, and maximize positive outcome (Abu, 2003).

According to Wilson (2005) and PMI (1996), and PMBOK Guide (2017), there are four basic strategies that are used by project manager or team to address a risk event. These are

### **Avoid risk:**

Identify the root cause of a risk event and eliminate or alter the conditions of the activity to create a new scenario without the potential risk. This is simply eliminating the risk before it happens and should be the best-case action in response to a risk. The caution to the project manager and project team for eliminating a risk is what actions have to be taken to eliminate or alter a condition and what effects that could have on the output deliverable for that work activity. Examples- Avoid the risk by taking action that will eliminate the possibility of risk.

**Reduce risk:**

Similar to avoidance in altering the conditions of a work activity such that although it may not be possible to completely eliminate the potential risk, it can reduce the impact or probability of its occurrence. Any action that can be taken to either reduce or eliminate a risk event should be the first course of action the project manager takes in planning response.

**Transfer risk:**

It requires the reassignment of responsibility in such a way that the impact of the risk is absorbed by an alternate party. An example of this would be using an external subcontractor for a particular work activity with significant potential risk items as opposed to using the organization's internal resources, thus transferring some or all of the responsibility of identified risks out of house

**Accept risk:**

The last course of action the project manager should use in planning a response for a potential risk event—simply accepting the outcome of the risk. There may be some conditions given a specific work activity where specifications do not allow any alteration of the conditions to eliminate, mitigate, or transfer the impact of a risk event, and the project must bear the full brunt of the impact. But this response can be acceptable as a function of risk tolerance if the specific risk event has minimal potential impact to the success of the project.

Accept the risk by accepting the possibility that this risk can happen, particularly, those which are low in probability and impact. In this case we are accepting the possibility that this risk will occur. For example accepting a supplier's delay by two days instead of hiring a new one which will take two weeks

- Minimize uncertainty through gathering adequate information, and this ultimately leads to re-evaluation of the likelihood and impact;
- Eliminate or avoid the risk factor that might result in a partial or complete re-design, a different strategy or method;
- Transfer the risk element by contracting the affected work;
- Insure against the occurrence of the factor;
- Terminate the project if the risk is not tolerable and if there is not another way that could be undertaken to mitigate the potential damages and hazards.

There are other sources that support the above argument. Vein, Smith *et al*, (1999) and Ceric (2003), for example, asserts that depending on the level of risk exposure, risks can be categorized as unacceptable, undesirable, acceptable or negligible. Decisions are made based on how much these classifications affect the risk. According to them, based on the strategies, the below conclusion is made:

- If a risk is grouped as unacceptable, the response to it could be risk avoidance or risk transfer;
- If a risk is grouped as unacceptable, the response may risk avoidance or risk transfer, risk reduction or risk sharing with the appropriate risk monitoring;
- If a risk is grouped as acceptable, the response to it may be risk retention with proper risk monitoring;
- If a risk is grouped as negligible, no response is needed.

### **Positive Risk**

A risk event that has a positive effect on the project activity can be taken as a positive risk and it is considered as an opportunity that should be addressed (Wilson, 2015). He also notes that “just as unplanned problems can affect work activities, unplanned opportunities in some cases present themselves where the project manager should be prepared for a response”. There are times when a risk event, despite its potential of causing a problem, can also generate an opportunity that would have not been otherwise available. Positive risks (Ibid). Positive risks affect planning for a response which ultimately help the project team alternatives on how to best exploit the opportunity. According to Hison(2003), Wilson(2015) and Alem(2020), there are

four important response plans that can be utilized when the opportunity is available, and each of them are treated below:

**Exploit:** here the full advantage of the opportunity and the benefits that might be available are taken by the project team, The project manager encourages actions that enhance the probability of the opportunity and maximize the benefit that would be realized..

**Enhance:** The purpose of enhancing is to maximize the benefits. In other words, an option where the response is to promote more actions that increase the probability of its occurrence and more importantly it increases the impact of the opportunity.

**Share:** when the project participant may not control the risk exposure by himself/themselves, there is a possibility to share the risk with other participants and in this case, part of the risk could be transferred.in other words, an opportunity might have been discovered by one party and further enhanced by one or more parties to maximize the benefit shared by all.

**Accept:** this refers accepting the consequences and it can be active by developing a contingency plan to use should the risk event happen or passive by accepting a lower profit margins if some activities overrun. This is simply acknowledging that the opportunity exists and taking advantage of the opportunity if presented, but not necessarily engaging in activities that would increase its probability.

#### **2.6.5.4 Risk Monitoring and Control**

As mentioned in the aforementioned pages, risk identification and analysis is not a onetime thing. Thus, checking on identified risks and other potential risks is crucial in managing project work. Regarding this, Mohammed(2016) asserts that the risk monitoring and control phase of risk management is used to check how the identified risks are handled and it also monitors the residual risks and their impact on the project work. He further notes that this stage is responsible for ensuring the implementation of risk schedule and evaluation and how to minimize it and prepare reports to determine the potential of new risks and the mechanism to handle them, and the result is communicated with project team

Similarly, Alem(2020) states that monitoring and control stage is used to check and regulate identified risks, check residual risks, and identify new ones which arise during the course of the project. Accordingly, risk response plans are designed and evaluation of their efficiency while the project is on progress is equally important. A comprehensive explanation of monitoring risks is forwarded by PMBOK Guide (2017). According to this resource, monitoring risks is the process of the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project.

## **CHAPTER THREE**

### **Methodology**

A research process consists of a number of sequential steps. It begins with finding the research area and formulating research questions. Further, the investigation method should be chosen along with research design and data collection techniques. Finally, the collected data is analyzed and interpreted and that leads to drawing conclusions (Bryman and Bell, 2003).

The research method is a technique for collecting data which can involve specific instruments such as self-completion questionnaires or structured interview. In other words, a mixed method approach where both quantitative (which is dominantly used in this study) and qualitative (through which additional information is gathered) are used to explore information. For the purpose of this study, a quantitative method was employed so that secondary data were obtained from various sources such as previous research work, journals and more importantly through using structured questionnaire which was distributed to key stakeholders engaged in building construction projects. Analyses of the data gathered from distributing questionnaire were done using statistical package for social sciences **SPSS Computer Software and Relative Importance Index (RII)**. In addition, a qualitative research method was chosen to provide a description of how people experience the application of Risk Management in the complex

projects like that of the building construction projects. According to Morgan and Smirch (1980) the choice of the method should be made based on the nature of the research problem. Qualitative methods are based on the facts which are socially constructed rather than objectively and are based on peoples' experience (Noor, 2008). Thus, interview questions were used to know more about the experiences, views and opinions stakeholders have about risk management in building construction project.

Finally, an evaluation and analysis of results were made based on data gathered, and then conclusions and recommendations were drawn accordingly.

### **3.2 Research Design**

The risk factors were generated based on the knowledge obtained from literature review which explored the works of Enshassi and Mossa(2008) that identified 44 risk factors which they later categorized into nine groups, and the study of Laryea et al(2012) which also identified 42 major risk factors that impact construction in Ghana. Then, these main risk factors were adopted in a way they serve the purpose of this study.

### **Sources of Data**

As explained by Zikmund, et.al.(2013), a survey is used as a technique of gathering primary information from sample individuals. This study considered both primary and secondary source of information, and the dominant source of information was survey questionnaire. Accordingly, the primary data was collected from contractors used for the study. In addition, published and unpublished materials were explored. In this case, some books and various research outcomes and articles written on the topic under discussion (risk management practices of contractors) were used as sources of information. Some questions were set for interview just to support the data gathered through questionnaire and literature outcomes as well.

### **3.4 Population**

Basically, population is described as units that have the chance to be involved in the survey sample (Alem, 2020), and according to Groves et.al. (2009), "the units could be people, employee or members of a particular set."

This study considers contractors who are currently engaged in building construction projects in Addis Ababa. The contractors are chosen with the belief that they are the key players in the

industry. Thus, the study includes the grade-one contractors(BC-) because they are usually the ones who are in good shape in terms of finance, material provision, possessing experienced professionals with the relevant knowledge, expertise and practice in the sector. Compared to lower grade contractors, level one contractor often involve in designing and performing complex and huge building construction projects. Besides, focusing on contractors solely helps to make sample size manageable enough and efficient 39 of the contractors were considered as a population,

### **3.4.1 Sampling Size**

Sampling is defined as the process used in selecting representative units of a population for the study in a research investigation (Wood and Haber, 1998). Thus, the sampling frame of this study includes a list of grade one 39 contracting firms who are currently operating in Addis Ababa. These firms are registered in Addis Ababa City Administration Construction Bureau.

### **3.4.2 Sampling Method**

Purposive sampling technique that involves examining the entire population (i.e the total population) that have a particular set of characteristics (e.g. specific attributes/traits, experience, knowledge, skills, and exposure to an event, etc. Thus, the researcher used the entire population as participants of the study. He chose the total population because the size of the population is manageable in terms of budget and time allocated for this study.

## **3.5 Data collection Tools**

### **3.5.1 Questionnaire**

Questionnaire is usually believed to be inexpensive way of gathering data from a relatively large number of respondents. According to McLeod, S (2018), there are various reasons why questionnaire is used as a research tool to gather data. First, a questionnaire consumes less money and resources. Second, questionnaire gives the respondents the freedom to express themselves without being afraid of the researcher; information from the respondents is kept confidential as the respondents have the right not to mention their names. Third, in studies that have resources to pursue other data collection strategies, questionnaire can be a useful confirmation tool. In general, questionnaire is a multipurpose tool, and it allows the collection of both objective and subjective data by using open and closed questions. But for the purpose of this study, a close ended questions which incorporated different parts. Part I of the

questionnaire addresses the respondents' profile which seeks the background information about the respondents, and Part II deals with the risk factors and their level of severity; and Part II discusses about the preventative, remedial and risk analysis methods used by contractors.

### 3.5.1. Questionnaire design

The survey which involves the questionnaire was carried out to seek the view of contractor in respect to risk factors. A questionnaire accompanied with a covering letter was distributed to 39 contracting companies. An Amharic equivalent was given to each survey questions so that challenges that might appear as a result of language gap could be minimized.

The questionnaire used consisted of five sections in an attempt to satisfy the aim of the study.

The sections are as follows:

1. The organization profile
2. Identifies risk factors and their severity, Likert scale of 1 to 3
3. Relative usage of risks preventative methods on projects, using Likert scale of 1 to 5
4. Relative usage of risk mitigative methods on projects, using likert scale of 1-5
5. Relative usage of risk analysis techniques on projects, using likert scale of 1-5

Besides, the questionnaire was expected to elicit a general assessment of the significance of risks. Each respondent was required to rank each factor on a likert scale of 1 to 3 by considering its severity on project. In this case, rank 1 is refers to low risk, rank 2 is medium risk and rank 3 refers to factors with high risk impact. (Enshassi *et al*, 2008).

For part II of the questionnaire requires respondent's opinion on remedial methods of preventing risk prior to its occurrence, a likert scale of 1-5 is used; where level 1 shows significantly very low or "never", level 2 indicates significantly low or "rarely", level 3 means significantly moderate or "sometimes", 4 means significantly high or "often"; and 5 means significantly very high or "always". (Enshassi *et al*, 2008).

Part II where it covers assigning the relative use of each technique for risk analysis, and to quantitatively demonstrate the relative significance of the risk analysis techniques adopted in building projects practice using the same likert scale. Similarly, the relative importance of each mitigation method used the same likert scale of 1-5. (Enshassi *et al*, 2008).

## Interview

Interviews enable the researcher to do basically the qualitative part of the study, and the information gained through interview was believed to support the data gathered through questionnaire. In this particular study the researcher tried to interview 4 contractors (10% of the entire population), and random selection was employed to select the four respondents. Structured and semi-structured questions were used for the interview. The questions target mainly topics related to risk factors, preventative methods, remedial methods and Risk Analysis techniques.

## 3.6 Data Analysis

This research work adopted the Quantitative analysis in order to achieve the objectives of the study. The Quantitative statistical analysis of this study used the average mean scores calculated with the help of Statistical Package for Social Sciences (SPSS) to rank the severity of each risk factor identified by the respondents (contractors) in the delivery of building projects in Addis Ababa. The mean values were compared to rank the groups and for the overall sub-factors.

To generate the result, the Statistical Package for Social Sciences (SPSS) was employed. The Relative Importance Index (RII) helped to determine the severity of risk factors and the usage relativity of management practices. Mohammed (2016), citing Adnan et.al (2007), used the below formula for computing Relative Importance Index (RII):

$$\text{Importance Index} = \frac{\Sigma (1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5)}{5(n_1 + n_2 + n_3 + n_4 + n_5)}$$

Where:

n1 - number of respondents who answered “never”

n2 - number of respondents who answered “rarely”

n3 - number of respondents who answered “sometimes”

n4- number of respondents who answered “often”

n5- number of respondents who answered “always”

## CHAPTER FOUR

### RESULTS AND DISCUSSIONS

#### 4.1 Introduction

In this chapter, the results of the study are discussed. It begins with profile of the respondents, and goes on discussing the identified risk factors and their level of severity. Also, risk management practices namely, preventative methods, remedial methods and risk analysis techniques are discussed.

Out of the 39 questionnaire that were distributed to the target respondents, 39 valid response representing 100% was returned.

#### 4.2 Profile of the Respondents

	<b>Contractors' Response</b>	
<b>Position</b>	<b>Valid return</b>	<b>Percentage of valid return</b>
Director	<b>3</b>	<b>7.7</b>
Deputy director	<b>4</b>	<b>10.3</b>
Project manager	<b>9</b>	<b>23.07</b>
Site engineer	<b>19</b>	<b>48.7</b>
Other	4	<b>10.3</b>

Total	39	<b>100</b>
<b>Respondents' Educational Status</b>		
Diploma	1	2.6
Bachelor Degree	28	71.8
Master Degree	10	25.6
Total	39	100.0
<b>Field of Specialization of respondent</b>		
Engineering	22	56.4
Architecture	5	12.8
Project Management	1	2.6
Construction management	4	10.3
Other	7	17.9
Total	39	100.0
<b>Number of projects executed to date</b>		
1-5	10	25.6
6-10	7	17.9
11-20	9	23.1
More than 20	13	33.3
Total	39	100.0
<b>Experience of respondent in building construction project</b>		
1-3	10	25.6
3-5	5	12.8
5-10	13	33.3
More than 10 years	11	28.2
Total	39	100.0

**Table 2: Profile of respondents**

Source: Field Survey (2022)

As can be seen from the above table, this part of the questionnaire dealt with respondents' position, educational status, field of specialization, number of projects executed to date, and experience of respondents' in building construction projects.

As shown here (Table 4.1), a total 19 respondents, are site engineers and this comprises the largest number which is 48.7% of the total, and the second largest number of the population which is 6(15.4%) is made up respondents who are project managers. The third largest population of the respondents which consist of deputy director and other, and each of them accounted for 10.3% of the total number of respondents.

As indicated in Table 4.2, a significant number of the respondents which 28(71.8%) have earned their first degrees, and also a significant number of the total of 10 respondents (25% of the total respondents) did their second degrees.

With regard to respondents' field of specialization, the largest number of them (22) which makes 56.4% of the total population specializes in Engineering. This is followed by other and Architecture which comprise of 7(17.9%) and 5(12.8%) Of the total number of respondents respectively. 4(10.3%) of the respondents specialize in construction Management. But surprisingly, there is only 1(2.6%) of the total population attended Project Management as an area of study. This shows that many people run construction projects without having proper knowledge of project management which is one the crucial components of construction project implementation processes.

As to the number of projects executed to date, the Table shows that 13 respondents which comprises 33.3% of the total population have executed more than 20 projects so far, and 10(25.6%) of the respondents have worked on 1-5 projects, 9(23.1%) of the participants have implemented between 11 to 20 projects. The least number of respondents which comprise 7(17.9%) have participated in 6 to 10 projects up to now.

With regard to the experiences the respondents had in building construction projects, the table shows that 11 respondents at 28.2% of the total have run projects for more than 10 years. And those who served between five to ten years 13 and this made it 33.3% of the total. Respondents who have served in the construction projects for more than three years, but less than five years were 10 and this made 26.6% of the total respondents.

### **4.3 Risk Factors Identification and severity**

As indicated in the questionnaire, 44 risk factors, which are believed to affect construction projects, were used for the purpose of this study. The identified risk factors and their severity will be discussed in the subsequent pages.

### 4.3.1 Identified Risk Factors

One of the objectives of this study was to identify risk factors that commonly affect construction projects. Thus, respondents were asked to indicate which of the risks categorized affect their projects. And they were required to choose “YES” across risk factors that they think affect their projects, and “NO” for those factors that do not usually affect the project(s) they run.

Table 3: below depicts information about the identified risks according to the individual risks and the categorized risk factors.

Risk Factors			Valid Returns		Percentage of Valid Returns	
			Yes	No	Yes	No
PHYSICAL	RF 1	Poor safety procedures resulting into Accident Occurrence	39	0	100	0
	RF2	Supplies of defective materials	38	1	97.4	2.6
	RF3	Varied labor and equipment	31	8	79.5	20.5
Environmental	RF4	Acts of God	30	9	76.9	23.1
	RF5	Difficulty to access the site	36	3	92.3	7.7
	RF6	Adverse weather conditions	37	2	94.9	5.1
DESIGN	RF7	Defective design (incorrect)	39	0	100	0
	RF8	Not coordinated design	38	1	97.4	2.6
	RF9	Inaccurate quantities	38	1	97.4	2.6
	RF10	Lack of consistency between bill of quantities, drawings and Specifications	37	2	94.9	5.1

	RF11	Rush Design	39	0	100	0
	RF12	Awarding the design to unqualified designers	39	0	100	0
LOGISTICS	RF13	Unavailable labor, materials and equipment	36	3	92.3	7.7
	RF14	Undefined scope of working	34	5	87.2	12.8
	RF15	High competition in bids	35	4	89.7	10.3
	RF16	Inaccurate project program	38	1	97.4	2.6
	RF17	Poor communications between the office and field workers	36	3	92.3	7.7
FINANCIAL	RF18	Delayed payments on contract	38	1	97.4	2.6
	RF19	Financial failure of the contractor	38	1	97.4	2.6
	RF20	Unmanaged cash flow	36	3	92.3	7.7
	RF21	Exchange rate fluctuation	36	3	92.3	7.7
	RF22	High Interest Rate	36	3	92.3	7.7
	RF23	Minimum amount interim of payment	33	6	84.6	15.4
LEGAL	RF24	Difficulty to get permits	33	6	84.6	15.4
	RF25	Ambiguity of work legislations	35	4	89.7	10.3
	RF26	Legal disputes during the construction phase	38	1	97.4	2.6
	RF27	Delayed disputes resolutions	38	1	97.4	2.6
	RF28	No specialized arbitrators to help settle fast	35	4	89.7	10.3
CONSTRUCTION	RF29	Rush bidding	34	5	87.2	12.8
	RF30	Unrealistic Project Schedule	38	1	97.4	2.6
	RF31	Undocumented change orders	37	2	94.9	5.1
	RF32	Lower quality of work	38	1	97.4	2.6
	RF33	Changes in design	38	1	97.4	2.6
	RF34	Difference in actual and contract executed quantities	37	2	94.9	5.1

	RF35	Lack of qualified & competent professionals	35	4	89.7	10.3
	RF36	High project complexity	33	6	84.6	15.4
POLITICAL	RF37	Change of government	33	6	84.6	15.4
	RF38	Change of government policy	35	4	89.7	10.3
	RF39	New governmental acts or legislations	36	3	92.3	7.7
MANAGEMENT	RF40	Ambiguous planning due to project complexity	37	2	94.9	5.1
	RF41	Resource management	38	1	97.4	2.6
	RF42	Changes in management ways	34	5	87.2	12.8
	RF43	Information unavailability (include uncertainty)	38	1	97.4	2.6
	RF44	Poor communication between parties involved	38	1	97.4	2.6
		Percentage of valid returns for risk category				

**Source: Field Survey (2022)**

As shown in Table 4.3 above, it can be seen that all the 44 risk factors addressed here affect the work of construction projects with a slight difference of degree of impact on projects. The data shows risks related to design and physical categories outweigh the rest of the risk factors. But still the remaining factors affect the construction work meaningfully in Addis Ababa. Just to mention those risks that stand out from the rest, with 100% response rate, the following are the major ones.

1. Poor safety procedures resulting into accident occurrence (100 %)
2. Defective design (incorrect)-(100%)
3. Rush Design (99%)
4. Awarding the design to unqualified designers (100%).

### **Severity of Identified Risk Factors on Construction Projects**

The study set a second objective of assessing the severity of the identified risks that mainly affect construction projects in Addis Ababa. Contractors were required to assign severity weight

to the identified risk factors under each of the various identified categories. The results of the identified risk grouped under their respective categories are tabled below with emphasis on the aggregate weight, severity and risk class.

IDENTIFIED RISK FACTORS		Weight	Severity (1-3)	Risk Rank
<b>PHYSICAL</b>				
RF 1	Poor safety procedures resulting into Accident Occurrence	36	2.58	High
RF2	Supplies of defective materials	38	2.55	High
RF3	Varied labor and equipment	31	1.83	Medium
<b>ENVIRONMENTAL</b>				
RF4	Acts of God	30	1.90	Medium
RF5	Difficulty to access the site	36	2.02	Medium
RF6	Adverse Weather Conditions	37	1.80	Medium
<b>DESIGN</b>				
RF7	Defective design (incorrect)	30	1.76	Medium
RF8	Not coordinated design	38	2.13	High
RF9	Inaccurate quantities	38	2.15	High
RF10	Lack of consistency between bill of quantities, drawings and Specifications	37	1.92	Medium
RF11	Rush Design	38	1.7	Medium
RF12	Awarding the design to unqualified designers	33	2.31	High
<b>LOGISTICS</b>				
RF13	Unavailable labor, materials and equipment	36	2.17	Medium
RF14	Undefined scope of working	34	1.88	Medium
RF15	High competition in bids	35	1.71	Medium
RF16	Inaccurate project program	38	1.94	Medium
RF17	Poor communications between the office and field workers	36	1.77	Medium
<b>FINANCIAL</b>				
RF18	Delayed payments on contract	38	1.76	Medium
RF19	Financial failure of the contractor	38	2.23	High
RF20	Unmanaged cash flow	36	1.88	Medium
RF21	Exchange rate fluctuation	36	2.19	High
RF22	High Interest Rate	36	2.00	Medium

RF23	Minimum amount interim of payment	33	1.84	Medium
LEGAL				
RF24	Difficulty to get permits	33	1.76	Medium
RF25	Ambiguity of work legislations	35	1.77	Medium
RF26	Legal disputes during the construction phase	38	2.00	Medium
RF27	Delayed disputes resolutions	38	1.89	Medium
RF28	No specialized arbitrators to help settle fast	35	1.62	Medium
CONSTRUCTION				
RF29	Rush bidding	34	2.00	Medium
RF30	Unrealistic Project Schedule	38	2.37	High
RF31	Undocumented change orders	37	2.05	High
RF32	Lower quality of work	38	2.26	High
RF33	Changes in design	38	2.05	High
RF34	Difference in actual and contract executed quantities	37	2.30	High
RF35	Lack of qualified & competent professionals	35	2.20	High
RF36	High project complexity	33	2.2	High
POLITICAL				
RF37	Change of government	33	2.15	High
RF38	Change of government policy	35	1.80	Medium
RF39	New governmental acts or legislations	36	1.97	Medium
MANAGEMENT				
RF40	Ambiguous planning due to project complexity	37	1.97	Medium
RF41	Resource management	38	2.07	Medium
RF42	Changes in management ways	34	1.82	Medium
RF43	Information unavailability (include uncertainty	38	1.81	Medium
RF44	Poor communication between parties involved	38	1.94	Medium

**Table 4:** Severity of Identified Risk Factors on Construction Projects

Source: Field Survey (2022)

Each of the risk categories are and individual risk factors are discussed in separate as follows: below.

### **Severity of the Physical Category Risk**

IDENTIFIED RISK FACTORS		Weight	Severity (1-3)	Risk Rank
<b>PHYSICAL</b>				
RF 1	Poor safety procedures resulting into Accident Occurrence	36	2.58	High
RF2	Supplies of defective materials	38	2.55	High
RF3	Varied labor and equipment	31	1.83	Medium

**Table 5: Severity of the Physical Category Risk**

Results from this category depict that poor safety procedures resulting into accident occurrence, and defective materials supply are identified as the most significant risk factors that affects the construction projects. Varied labor and equipment is the second significant factor in terms of its severity on projects. In general, the first two in this category are categorized as high risk factors in construction projects which demand more attention to manage them and achieve project objectives. Also, the information gathered through interview supports the data found through questionnaire. For example, the interviewees were asked about major risk factors in building construction projects. They most of them stated that safety of the workers is one of the major components that has been given attention and risks are usually treated after the accident occurred. In other words, risks related safeties of workers are not given advance notice and caution. Thus, risks under the physical category calls for attention of the people who run the building construction projects, mainly the contractors who often oversee and manage the work of construction being done.

### **Severity of Environmental Category**

<i>ENVIRONMENTAL</i>		<i>weight</i>	<i>Severity (1-3)</i>	<i>Risk Rank</i>
<i>RF4</i>	<i>Acts of God</i>	<i>30</i>	<i>1.9</i>	<i>Medium</i>
<i>RF5</i>	<i>Difficulty to access the site</i>	<i>36</i>	<i>2.02</i>	<i>Medium</i>
<i>RF6</i>	<i>Adverse Weather Conditions</i>	<i>37</i>	<i>1.80</i>	<i>Medium</i>

As indicated in Table 4.3 above, the respondents considered all the three risks under the environmental category and they ranked them as medium. However, the fact that the risks are categorized medium does not mean they are neglected. Although it is less common to face risks related to Acts of God, it is inevitable that the environmental art of risk category impacts

construction projects and brings undesirable consequences on project work. This risk factor should not be disregarded as it has a potential to impact a project run negatively. In other words, attention should be given to putting a system in place that helps manage such risk,

In fact it may be uncommon to see environmental risks occurring. But the consequence of their occurrence could result in a devastating effect on construction projects. The effect could be reflected on the triple constraints (schedule, money, and quality) and other related consequences.

But it should be notes that these factor(s) that have high significance when it comes to severity on construction projects in Addis Ababa. For example, there are cases when contraction projects are run in villages/neighborhoods where the roads are tough to transport construction materials to the project sites. Some old villages are a good proof of the case in point. Besides, there are cased when unusual weather hinders the work of construction projects. For example, heavy rains sometimes affect the physical conditions through floods and storms. Therefore, alternative plan should be considered when the planning to construct a building is undertaken. The classification and nature of the environmental risk factors is reflective and in consistent with the observation of (Kartam, 2001).

### Severity of Design Category

	DESIGN	weight	Severity (1-3)	Risk Rank
RF7	Defective design (incorrect)	30	1.8	Medium
RF8	Not coordinated design	38	2.1	High
RF9	Inaccurate quantities	38	2.2	High
RF10	Lack of consistency between bill of quantities, drawings and Specifications	37	1.9	Medium
RF11	Rush Design	38	1.7	Medium
RF12	Awarding the design to unqualified designers	33	2.2	High

**Table 6:** Severity of Design Category

There are three risks here which are ranked as high. It is belied that risks classified under the Design category are critical for the successful accomplishment of construction projects. Not having a coordinated design, inaccurate quantities and awarding the design work to unqualified designers are the risks stood out dominantly here.. The remaining three risks in this category are important to consider. That is why they are rated that has medium significance by the respondents.

The study conducted in Ghana by Mohammed (2016) confirms that the risks categorized under the Design category are usually critical to the success of constructions projects. According this study, awarding the design to unqualified designers (with 2.57) severity was one of those risks identified. Usually, the design of a project is beyond the full control of the contractors, it can be deduced from the data that the contractors are provided with a design which s incomplete or in adequate information required to carry out the construction work. As a result, there could be a potential the contractor is exposed to a design with high risk factors. Thus, it is crucial to ensure and make documents available for the contactor. Regarding this, Kartam(2001), among the risk factors under the Design category, contractors given uncoordinated design are expected to assess the rest of the design categorized risk factors to be high significant risk factors.

**Table 7: Severity of logistic Category**

	LOGISTICS	weight	Severity (1-3)	Risk Rank
RF13	Unavailable labor, materials and equipment	36	2.0	Medium
RF14	Undefined scope of work	34	1.6	Medium
RF15	High competition in bids	35	1.7	Medium
RF16	Inaccurate project program	38	1.9	Medium
RF17	Poor communications between the office and field workers	36	1.8	Medium

With regard to severity of logistics risks, the results show that the respondents (contractors) assigned a medium risk value for all the sub-risk categories. Whereas in the study done by Mohammed(2016), which conducted in Ghana, it was mentioned that risks such as unavailable resources(labor, materials and equipment) and inaccurate project program were factors that rate the top with each possessing severity level of **2,36**. Undoubtedly, the risk factors under the category of logistics are critical and have meaningful contribution for the accomplishment of construction projects. Hence, it important for the contractors to pay attention to risk factors related to logistics risk category so that they could make run their project in a less challenging environment.

Basically, Logistics as a risk category and by its very nature requires a well-established system that manages inputs (material, labor, and other resources) in a professional manner.

**Table 8: Severity of Financial Category**

	FINANCIAL	weight	Severity (1-3)	Risk Rank
RF18	Delayed payments on contract	38	1.9	Medium
RF19	Financial failure of the contractor	38	2.2	High
RF20	Unmanaged cash flow	36	1.9	Medium
RF21	Exchange rate fluctuation	36	2.2	High
RF22	High Interest Rate	36	2.0	Medium
RF23	Minimum amount interim of payment	33	1.9	Medium

As shown in the Table 4.3, almost all the respondents ranked financial failure of the contractor and exchange rate fluctuation risks as the ones that have high severity. The contractors also rate the remaining four risks as medium risk factors that affect construction projects. It is undeniable that every citizen is experiencing the impact of exchange rate fluctuation in the day to day increase in the price of items which is often associated with foreign currency, and in fact the business in construction industry may not escape this challenge. With regard to financial failure of the contractors, Hallaq(2003) argues that it could result from:

- Dependency on a bank with its associated high borrowing rates;
- Unavailability of capital;
- Inexperience in the execution of specific works;
- Lack of efficient cash flow management;
- Experience in contract management;
- Offering contracts to a contractor using the lowest bidder criterion;

In the study conducted by Alem(2020), risk factors like Delayed payments on contracts, and financial failure of the contractors ranked as high and high-medium respectively. Whereas in this study, it can be seen that Delayed payment is rated medium which means it is may not be as severe as it used to be, but financial failure of the contractor in this study is rated as high. For the financial failure of the contractor, one could have an intellectual guess that the current political situation of the country might contribute to financial condition contractors are encountering, besides the potential reasons mentioned by Hallaq(2003).

**Table 9:** Severity of Legal Category

	LEGAL	weight	Severity	Risk Rank
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			(1-3)	
RF24	Difficulty to get permits	33	1.8	Medium
RF25	Ambiguity of work legislations	35	1.8	Medium
RF26	Legal disputes during the construction phase	38	2.0	Medium
RF27	Delayed disputes resolutions	38	1.9	Medium
RF28	No specialized arbitrators to help settle fast	35	1.8	Medium

As shown in the Table here, risks under the Legal category are all rated medium in terms of severity/impact they have on construction projects. The researcher, from his personal experience, could see different building projects in Addis Ababa which are undergoing some legal issues (delayed dispute resolutions). This obviously results in schedule overrun which inevitably lead to cost overrun. Though they are all rated as medium, risks under Legal category are still crucial in construction project execution processes. A study conducted by (2016), which done in Ghana, shows that disputes resolution was one the risk factors ranked as high; however, the remaining risks under Legal category rated as medium, and it was assumed that contractors engaged in construction industry may not suffer significantly from the risks classified as medium risk factors. In another context such as Hong Kong, getting a permit from the concerned bodies (officials) is one of the major requirements to start construction projects and therefore poses a great risk to contractors (Ahmed et al, 1999).

#### 4.3.7 Severity of Construction Category

	CONSTRUCTION	weight	Severity (1-3)	Risk Rank
RF29	Rush bidding	34	2.0	Medium
RF30	Unrealistic Project Schedule	38	2.3	High
RF31	Undocumented change orders	37	2.1	High
RF32	Lower quality of work	38	2.3	High
RF33	Changes in design	38	2.1	High
RF34	Difference in actual and contract executed quantities	37	2.3	High
RF35	Lack of qualified & competent professionals	35	2.2	High
RF36	High project complexity	33	2.2	High

Table 10: Severity of construction category

As indicated in the Table, as opposed to the other risk categories considered in this study, all the risk factors, except Rush bidding, under the Construction risk category are ranked as high risks. This is one proof of how significant these risk factors are, and unable manage them properly. It is not uncommon to see buildings in Addis Ababa suffer from lack of proper schedule, lower quality of work, changes in design, and high project complexity. The fact that there is lack of qualified and competent professionals could contribute to the other risk factors in this risk category.

Evidence from the research conducted by Mohammed (2016) argues that these risks are rated as high risks due to the fact that contractors often look for payments earned through work done outside the scope as claims may not be made along the main works. According to Mohammed, When contractors focused on the lower quality of work, it entails that they are cost conscious and choose to spend quality time doing works than have repetition of work which might demand expending of more resources to the disadvantage of the contractor. Risks related to design change, for example, could create an implementation gap which can have an impact on time allocated for the work of the project, and there is a possibility of redoing some the work already done, and such practice obviously could require additional cost.

### Severity of Political Category

	POLITICAL	weight	Severity (1-3)	Risk Rank
RF37	Change of government	33	2.15	High
RF38	Change of government policy	35	1.80	Medium
RF39	New governmental acts or legislations	36	1.97	Medium

**Table 11: Severity of political category**

As shown in the Table here, the only risk that contractors rated high is a risk that is related to change of government. The remaining two are ranked as medium risks. In fact, in countries like Ethiopia where political instability is not uncommon, the chance of encountering risks that affect construction projects could be high. For example, personal experiences show that a change in government brings a change on how a system works. A government that comes to power has its own priorities and development agenda. Thus, building projects began by the previous government may not be given the same or similar attention by the new one. Therefore,

It seems that contractors give less attention to issues related to new acts and legislations compared to the other risk factor. The possible reason could be that because these acts have limited adverse effects on construction projects.

### Severity of Management category

	MANAGEMENT	weight	Severity (1-3)	Risk Rank
RF40	Ambiguous planning due to project complexity	37	1.97	Medium
RF41	Resource management	38	2.07	Medium
RF42	Changes in management ways	34	1.82	Medium
RF43	Information unavailability (include uncertainty	38	1.81	Medium
RF44	Poor communication between parties involved	38	1.94	Medium

**Table 12: Severity of management of category**

It is illustrated in the Table that all the risks under construction risk category are rated medium by the contractors. Although their severity is rated medium here the significance of these risk factors is something to keep an eye on; they should not be disregarded. For example, Ambiguous planning due to project complexity, Resource management and Poor communication between parties involved can still be crucial risk factors to consider in construction projects. A study by Yakubu(2014) shows that the contractors seemed to agree on the most crucial management related risks that affect the project objectives, and they rated them as high risk factors. These risks were: ‘resource management and bureaucracy or administrative procedures’, and they both contribute to delay in projects. And they are some of risks Ethiopian building construction work could be challenged by. The construction projects in Addis Ababa may not escape these challenges. The complex bureaucracy (the way the management works) that is operating in Ethiopia could be one of the reasons for construction project delays.

Thus, it is prudent the contractors should incorporate manage meet management category related risks when they intend to plan project activities for unable manage these risks may lead to project failure together with other contributing factors.

### 4.4 Summary of Severity of Risks

As shown in Table 4.3 above, all the risks identify are ranked according to their level of severity, as high and medium risk factors. There is not any risk that is ranked as low risk factor.

The results indicate that building construction contractors in Addis Ababa focused on the following top risks (they are all high) according to their category and level of severity.

Risk category	Risk factors	Risk Rank
PHYSICAL	Poor safety procedures resulting into Accident Occurrence	2.58 (High)
PHYSICAL	Supplies of defective materials	2.55 (High)
DESIGN	Not coordinated design	2.10 (High)
DESIGN	Inaccurate quantities	2.20(High)
DESIGN	Awarding the design to unqualified designers	2.20 (High)
FINANCIAL	Financial failure of the contractor	2.20 (High)
FINANCIAL	Exchange rate fluctuation	2.20(High)
CONSTRUCTION	Unrealistic Project Schedule	2.30 (High)
CONSTRUCTION	Undocumented change orders	2.10 (High)
CONSTRUCTION	Lower quality of work	2.30 (High)
CONSTRUCTION	Changes in design	2.10 (High)
CONSTRUCTION	Difference in actual and contract executed quantities	2.30(High)
CONSTRUCTION	Lack of qualified & competent professionals	2.20(High)
CONSTRUCTION	High project complexity	2.20(High)
POLITICAL	Change of government	2.15(High)

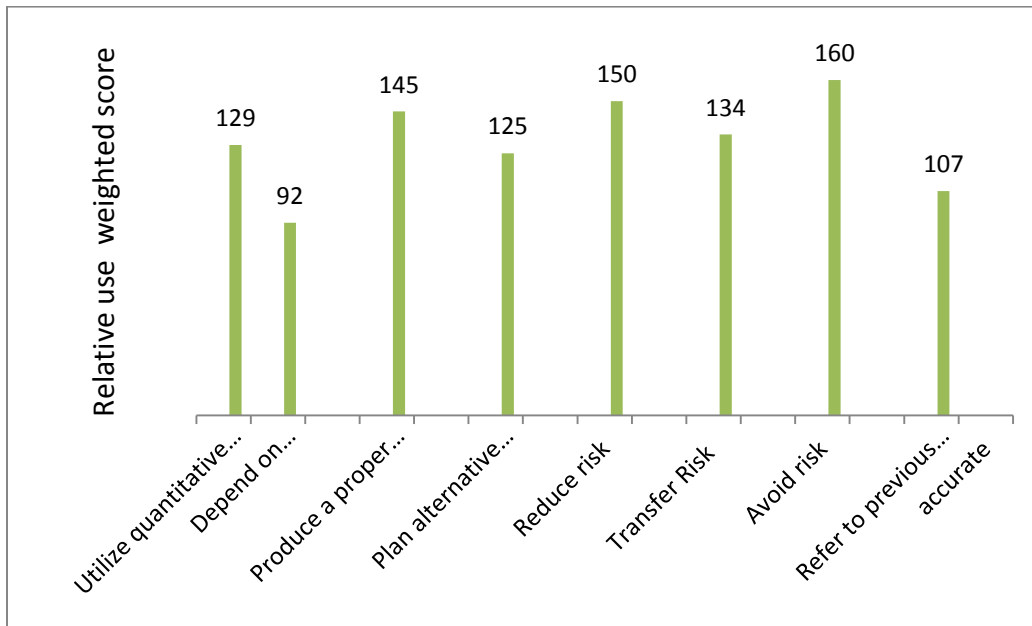
**Table 13: Summary of severity of risks**

Out of the 9 risk categories that are believed to affect the construction projects in Addis Ababa, five of the risk categories namely: the **Physical, Design, Financial, Construction** and **Political** risk categories were rated as high by contractors. As shown in the table above, there are 15 risk factors that were selected from each risk category. These 15 risk factors are the top ranking risks from the 44 list of risk factors used for this study. The remaining 29 risks factors are ranked as medium. The high ranking risks comprise 15(34.1%) of the total, and those that were rated as medium consist of 29(65.9%) of the list of the common risk factors. Therefore, contractors are advised to give attention to managing the most severe ones(the 15 risk factors) without disregarding the medium ranked risks as they still affect the construction project if left unnoticed.

#### **4.5 Risk Management practices of contractors in Addis Ababa**

Examining the risk management techniques that are practiced by Addis Ababa building contractors is one of the objectives this study treats. Accordingly this section deals with the risk management actions which were indicated in the questionnaire were categorized as preventive methods, Remedial Methods and Risk Analysis techniques and Tools. Hence, contractors were asked to indicate how often they use these methods in their risk management trends of construction projects, and they of course used a Likert Scale of 1 to 5 adopted to serve the purpose of this study. Three of the methods are discussed as follows:

#### 4.5.1 Preventive Risk Management Actions



**Figure 4 Preventive Actions**

Source: Field Survey (2022)

From the results obtained (Figure 4.1), Addis Ababa contractors tend use avoid risks preventive methods. There are also significant number of respondents who incline to employ reduce risk(150) and produce proper plan(145) methods as means to prevent risks. The other two

methods (utilizing quantitative risk analysis techniques for accurate time and transfer risks) are identified as the third important preventative methods. Compared to the rest of the techniques the two methods namely Depend on subjective judgment to produce a proper program and refer to previous and ongoing project for accurate program are given less weight, 92 and 107 respectively. However, in another study conducted in Ghana, it was stated that Ghanaian contractors incline to use **previous and ongoing similar projects for accurate program** and that is the most used preventive management method. But utilizing quantitative risk analysis techniques is the least used preventative method in addressing risk issues (Mohammed, 2016).

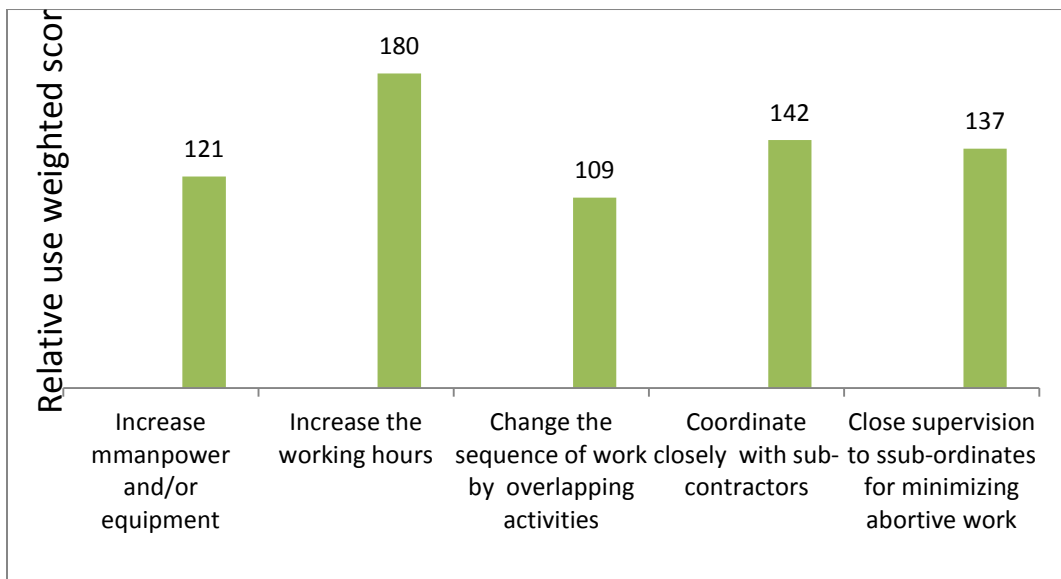
Despite contractors in Addis Ababa prefer to use avoiding risks as a major technique in their risk management practices, the information gathered through the interview contradicts with this claim. During the interview, the participants confirmed that there is little or no risk management system in place that treats risks before they happen. According to them, risks are usually addressed after they occur. Below are some of the points they discussed during the interview:

*The project managers, construction companies and contractors have very little understanding of risks. All they know is get to action once risks occur. I know a recent example where a contractor rushed to win the tender for a project rather than assess and take pre-risk management measures. These people didn't even bother to examine what might wait on his way. He took the project for 4.5 million birr without assessing the market trends and availability of resources including the supply chain patterns for those resources. Eventually the inflation took a toll on the performance of the project and the project was doomed to consume a budget sum of 17 million birr. Going by the law, this contractor is destined to lose every property registered in his name and go to jail for not finishing the project at the planned budget and time. Therefore, I think most contractors rush to win projects without assessing associated risks. They aim at maximizing the benefits thereby ignoring plans for managing risks. To me most of the challenges construction projects face relates to their inability to assess risks and plan the management steps. They do not give due attention and get ready to manage risks in advance. They do not do the required tasks ahead of time and get ready for unavoidable risks.*

Using avoiding risks as a common method of prevention seems unrealistic when they lack a well-established risk management system put in place. This might need further investigation to clear the doubts and confirm which claim is right. But the researcher, given his observation of

the risk management system in Addis Ababa, and the information gathered through interview, is encouraged to deduce that the contractors may not have adequate knowledge on conceptual definition of the term avoid risk. Avoiding risk involves identifying the root cause of a risk event and eliminates or alters the conditions of the activity to create a new scenario without the potential risk. This is simply eliminating the risk before it happens and should be the best-case action in response to a risk.

#### 4.4.2 Remedial Risk Management Method (Actions)



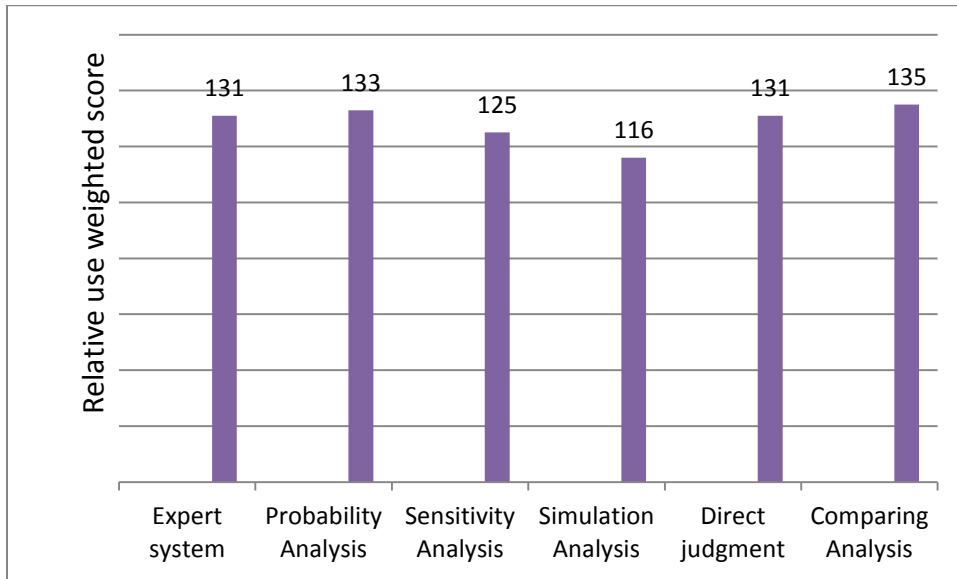
**Figure 5:** Remedial risk management methods

The five risks mitigating methods are shown in the figure (4.2) with their respective weighted score value. As can be seen from the data, the most used mitigating method identified by the contractors is increase the working hours, which is followed by coordinate closely with sub-contractors and close supervision to sub-ordinate methods. And the least used remedial method is change the sequence of work by overlapping activities.

Increase the working hours is the method contractors preferred to employ. In fact, there case when construction workers are encouraged to more hours than usual. This is done with the intention to complete the project work according to the schedule set, if possible. But such practice might incur additional budget since the workers are paid for working overtime, in addition to the regular work hours. Eventually, it is inevitable that contractors will be challenged by budget overrun and the project might suffer from unable to achieving the objectives of the projects which usually aims to manage time, budget and quality in a balanced manner. This is where the researcher got confused and unable to identify why the contractors chose to use increase working hours as their dominant remedial method in a country(Ethiopia) where contraction projects stumble due to lack of budget related issues(in addition to other contributing factors of course).

However, the fact that they prefer to use the other two methods (coordinate closely with sub-contractors and close supervision to sub-ordinates to minimize abortive work) could help ease the construction project activities, because they both have high stake to minimize risks and accomplish the work according to the plan set at the beginning. Naturally, the work of building construction demands collaboration among different stakeholders and working closely with sub-contractors and sub-ordinates is appreciated as the construction project progress depends on the collective input of available resources.

## **Risk Analysis Technique**



**Figure 6: Risk analysis techniques**

The results displayed in Figure (4.3) shows that the use of comparison as an analysis technique is the most used Risk Analysis Technique by Addis Ababa contractors. Simulation analysis using simulator computer packages seems uncommon as it is the least used technique. The results show a deficit in knowledge and lack of experience in the application of the various risk analysis technique. In order to get accurate risk estimation, there is a need for integration of expert techniques such as @Risk system and other relevant schedules and software.

#### **4.6 summary of the chapter**

In this chapter, information gathered through the questionnaire and interview is analyzed and discussion is made accordingly. It mainly focused the findings on the common risk factors construction projects encounter, and also the severity level individual risks have on projects as well as the risks management practices employed by contractors in Addis Ababa.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATION**

## 5.1 Introduction

This chapter deals with summary, conclusion and recommendations based on the findings of the study. Also, it recommends further study for researchers who are interested in conducting a study on the same topic.

This study was undertaken with the intention to identify building construction project risk factors, and to what extent these risks affect construction projects (i.e. their level of severity). Also, it aimed to see the preventative techniques, use of mitigative methods and risk analysis techniques employed in the construction sector. The study was conducted with particular focus on building construction contractors operating in Addis Ababa.

## 5.2 Summary of the Findings

At the outset, the study was conducted with the following basic research questions in mind. The literature review exploration on the topic of discussion was done, and questionnaire and interview were used to gather relevant data. The main questions posed were:

4. What are the risks that affect the building construction projects in Addis Ababa?
5. To what extent do these risks affect the Construction Industry?
6. What are the risk management techniques and practices being used by contractors to manage the identified risks?

### 5.2.1 Identify Risk Factors that mainly affect Construction Projects in Addis Ababa

The very first objective of the study was to identify risk factors that affect the building construction projects. Thus, with the help of literature review, the identification as well as the categorization of related risk factors was done. Accordingly, a list of 44 risk factors identified and grouped under the nine main categories (Physical, Environmental, Design, Logistics, Financial, Legal, Construction, Political and Management). Then, the severity level of individual risks was identified based on respondents' assignment.

### 5.2.2 Assess the severity of the identified risks on construction projects

After the identification of risks was done, the study tried to weigh the effects of the individual risk factors level of severity. Accordingly, it was that all the risk factors identified fall under medium risk factors and high risk factors. In this case, 15(34.1%) of the risks ranked as high risk factors which significantly affect the construction projects, and 29(65.9%) of them were rated as

medium risk factors. There was not any risk, among the identified risks, that was rated as low. One can reasonably guess that the fact that all the risks rated as medium and high could be due to their relevance to the construction project, and contractors feel that these risks affect their project implementation activities if left unnoticed.

### **5.2.3 The risk management techniques Contractors practice**

Another aspect of the study was to examine the risk management techniques employed by building construction contractors. The study considered the Preventative Techniques used, the Remedial Methods and Risk Analysis Techniques employed by contractors.

With regard to preventative methods, avoiding risk with weight score of (160), Reduce risk with weight score of (150) and Produce a proper schedule by getting updated project information with weight score of (145) considered as the most frequently used preventative techniques. Whereas methods like Depend on subjective judgment to produce a proper program with weight score of (92) and Refer to previous and ongoing projects for accurate program were rated as the least practiced methods.

As to the risk remedial methods, it was revealed that Increase working hours with weight score of (180) is the most frequently used remedial method. On the contrary, Change of the sequence of work by overlapping activities which weighed (107) is the least practiced method by contractors. But the other methods namely coordinate closely with sub-contractors (weighed 142), Close supervision to subordinates (weighed 137) and Increase manpower and equipment (weighed 121) seem to be used by contractors in a less frequent manner.

With regard to Risk Analysis Techniques, Comparing Analysis which is comparing similar projects through similar conditions with a relative weight of (135) and Probability Analysis (Analyze historical data) which is weighed(133) are the most frequently used techniques in the risk analysis process. They both have nearly the same weight and this shows that there is a tendency from the contractors to use the two techniques when they analyze the risks that affect the construction projects. Simulation analysis using simulator computer packages with the weight score of (116) seem to be the least used Risk Analysis Technique.

### 5.3 Conclusion

Construction sector has its own peculiarities that identify it from other sectors. It is one of the industries that rarely experience a zero risk. The fact that the work construction projects is widely spread and demands the involvement of many stakeholders and resources could differ it from other areas of economy. This along with other factors could expose it to risks. Taking the nature of the construction projects and the findings of the study, the following conclusion is made:

- Most of the risk factors explored and identified in this study affect the work of construction projects in Addis Ababa (the risk factors were ranked as medium and high in terms of level of severity)
- There are 15 (34.1%) of the risk factors which are identified as high risk factors and significantly affect construction projects;
- The remaining 29 (65.9%) of the risk factors were rated as medium risk factors which still demands attention to manage them;
- The construction risk category has the highest impact in terms of severity on projects activities;
- No risk is identified as low risk factor, all the risk fall under either high risk factor or medium risk factors;

Below are the 15 risk factors which are identified from five of the risk categories and they are all ranked high among the 44 risk factors:

1. Poor safety procedures resulting into Accident Occurrence
2. Supplies of defective materials
3. Not coordinated design
4. Inaccurate quantities
5. Awarding the design to unqualified designers
6. Financial failure of the contractor
7. Exchange rate fluctuation
8. Unrealistic Project Schedule
9. Undocumented change orders

10. Lower quality of work
11. Changes in design
12. Difference in actual and contract executed quantities
13. Lack of qualified & competent professionals
14. High project complexity
15. Change of government

- Contractors, for their risk management purpose, tend to use avoiding risk method as a preventative techniques;
- Increasing the working hours is the most dominant remedial method for managing risk;
- Comparing analysis of similar projects through similar conditions is the most frequently employed Risk Analysis technique used by contractors in Addis Ababa.

#### **5.4 Recommendation**

Based on the finding of the study, the following recommendations are made so that contractors who are currently engaged in building construction projects as well as those who will join the industry consider them in their risk management practices:

1. Poor safety procedures resulting into Accident Occurrence considered as one the severe risks; so contractors should give as much attention as possible to manage them.
2. Most of the risk factors under the design risk category were ranked high risk factors. Therefore, contractors should collaborate with those project stakeholders mainly responsible doing the designing aspect of the project. If possible, they need to be well informed about design related issues before they embark on execution of the project work. What is equally important is that the contractor needs to be involved with a competent designer in the design process of projects to prevent situations where defective designs are made available to the Contractor and subsequently forced to redo the works because of design changes.
3. Almost all the risk factors under the construction risk category were magnified in the study, and they were ranked high. For example, risk factors such as Unrealistic project schedule, lower quality of work, undocumented change orders, lack of qualified and competent professionals and high project complexity need immediate attention from the contractors as well as construction firms.

4. Financial failure of the contractor and Exchange rate fluctuation related risk factors should be kept an eye on as they are significant for the realization of project objectives. Contractors should assess thoroughly their financial capability before they get into the actual contract agreement with firms because it is sometimes the inability of the contractor, in terms of money, that delays projects work and in some cases contractors are put in prison for not able to deliver the project work as per their agreement with government or companies. Therefore, they should always check their financial wellbeing.
5. As a risk preventive method, contractors should not heavily rely on avoiding risk. They should also consider using other techniques depending on the nature of the risks and the context they are working in.
6. As we are in technology era, contractors are encouraged to have knowledge and skills of using software that support computer based risk analysis techniques, and they should be given training on this.
7. Overall, risk management is at its infant stage in Addis Ababa. Trainings which equip contractors with knowledge and skills necessary for construction risk management should be offered to update contractors and make them aware of the current trends and practices applied in risk management area.
8. The researcher does not claim this is a thorough study by itself. As risk management practice is at its infant stage in Addis Ababa (even as a country), further study is appreciated. The researcher encourages researchers to consider why risk management practices are not given as much attention by stakeholders other than contractors, and why risk has not become a culture by practitioners who usually run the business, particularly the construction industry.

This chapter discussed the summary of the findings concerning the identified risks, the severity level of these risks, and also examined the risk management techniques that are being practiced. Then, based on the summary of the findings, conclusions and recommendations were made. Suggestion of future research study on the topic was provided to help narrow the gap left unnoticed by this study.

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**Annex**

**ADDIS ABABA UNIVERSITY**

**COLLEGE OF BUSINESS AND ECONOMICS  
SCHOOL OF COMMERCE  
DEPARTMENT OF PROJECT MANAGEMENT**

**Interview Questions**

What are your opinions on the following risk management related questions?

1. What do you think are the major risk factors building construction projects encounter?

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2. Do you have a risk management system in place in building construction projects you run? If yes, what are they? And how do you involve other stakeholders?

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3. What are the challenges you often encounter in the effort you make to manage risks in building construction projects? And how do you overcome/manage them?

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4. Why do you think is risk management practices in building construction projects are at their infant stage /have not grown properly in Addis Ababa?

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**ADDIS ABABA UNIVERSITY  
COLLEGE OF BUSINESS AND ECONOMICS  
SCHOOL OF COMMERCE  
DEPARTMENT OF PROJECT MANAGEMENT**

**Questionnaire Survey: Assessing Project Risk Management Practices of Building Contractors**

Dear Sir/Madam,

I am currently conducting a study **to assess risk management practices of building construction contractors** in Addis Ababa. The study is expected to help assess and identify risks and the management practices employed in addressing them. Also, the finding will suggest contractors the alternative risk management practices in the construction field.

This study is conducted solely for academic purposes, and your responses will remain confidential. The finding of the study will be shared with participating contractor upon request.

I would like to thank everyone for being willing to fill out this questionnaire.

Sincerely yours,

Taye Melese

Post Graduate Student, in Project Management

AAU Tel: +251 115584467

Addis Ababa, Ethiopia

**Part I: Respondents Profile (please put a mark(X) to answer the questions.**

1. What is your current position in the construction projecting you working with? ሃላፊነትዎ ምንድነው?

- Director     Deputy Director     Project manager     site/office engineer  
other (please specify) \_\_\_\_\_

2. What is your education level? የትምህርት ደረጃዎ

- Diploma     B.Sc.     M.Sc.     PhD  
 other, please specify \_\_\_\_\_ ሌላ ካለ ይግለጹ \_\_\_\_\_

3. What is your field of specialization? በምን ሙያ ነው የተመረቁት?

- Engineering     Architecture     Project Management  
 Construction Management     other \_\_\_\_\_

3. How many projects have you worked on or implemented to date? እስካሁን የተሳተፉባቸው የፕሮጀክቶች ብዛት ስንት ናቸው?

- 5 projects or less     5-10 projects  
 11-20 projects     more than 20 projects

4. Experience in Building Construction Projects (in years)

በህንጻ ግንባታ (project) ያልዎት ልምድ ስንት አመት ነው?

- 1 year or less     1-3 years     3-5 years  
 5-10 years     More than 10 years

**Part II: 1-Risk factor Severity and Allocation**

Below is the table which contains the risk factors. Please indicate “YES” for risk factors that typically affect your projects and “NO” for those that you think do not affect your projects.

Assign the severity of each “YES” response factor.

<b>symbol</b>	<b>Meaning (ትርጉም)</b>
<b>1</b>	<b>Low risks (ዝቅተኛ ስጋት)</b>
<b>2</b>	<b>Medium risks (መካከለኛ ስጋት)</b>
<b>3</b>	<b>High Risk (ከፍተኛ ስጋት)</b>

<b>Risk Category</b> የስጋቱ(risk) ምደባ	<b>FID</b>	<b>Factors (ስጋቱን/ተጸዕኖቹን የሚያመጡ/የሚያስከትሉ ምክኛቶች)</b>	<b>Affects projects(ተጽእኖ ያመጣል)</b>	<b>Severity</b> የስጋቱ(risk)
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					ክብደት		
			YES አዎ	NO አይ	1	2	3
<b>Physical</b> አካላዊ	RF1	Poor safety procedures resulting into Accident Occurrence ደካማ የሆነ የጥንቃቄ ስልት የሚያስከትለው አደጋ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF2	Supplies of defective materials ጉድለት ያለባቸው ዕቃዎች አቅርቦት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF3	Varied labor and equipment የሰራተኞችና የመሰሪያ ዕቃዎች መለያየት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Environmental</b> አካባቢያዊ	RF4	Acts of God ( የፈጣሪ ስራዎች )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF5	Difficulty to access the site ወደ ስራ ቦታው በቀላሉ መግባትና መውጣት ያለመቻል	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF6	Adverse weather conditions አስቸጋሪ የአየር ሁኔታዎች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Design</b> ንድፍ/ዲዛይን	RF7	Defective design (incorrect) ጉድለት ያለበት ንድፍ/ዲዛይን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF8	Not coordinated design ያልተቀናጀ ንድፍ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF9	Inaccurate quantities ትክክለኛ ያልሆኑ የግብአት ምጣኔዎች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF10	Lack of consistency between bill of quantities, drawings and Specifications በሂሳብ መጠየቂያ የዕቃ ዝርዝር መግለጫዎች፣ በንድፎችና በዝርዝር መግለጫዎች መካከል ወጥነት አለመኖር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	FID	Factors (ስጋቱን/ተጸዕኖውን የሚያመጡ/የሚያስከትሉ ምክኛቶች)	Affects projects (ተጸእኖ ያመጣል)		Severity የስጋቱ(risk) ክብደት		
			Yes	No	1	2	3

	RF11	Rush Design የጥድሬያ ንድፍ (በችኮላ የተሠራ ንድፍ)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF12	Awarding the design to unqualified designers የንድፍን ስራ ብቃት ለሚገለጹ ንድፍ አገልግሎቶች መስጠት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Logistics</b> <b>ሎጂስቲክስ</b>	RF13	Unavailable labor, materials and equipment የጉልበት ስራተኛ፣ ቁሳቁሶችና መሳሪያዎች አለመኖር/አለመገኘት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF14	Undefined scope of working የስራው ስፋት አለመገለጽ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF15	High competition in bids የጨረታዎች ከፊተኛ ወድድር ያለባቸው መሆን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF16	Inaccurate project program ትክክል ያልሆነ ፕሮጀክት መርሃ ግብር/ዕቅድ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF17	Poor communications between the office and field workers በመስክና በቢሮ ስራተኞች መካከል ደካማ ግንኙነት መኖር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Financial</b> <b>ገንዘብ ነፃ</b>	RF18	Delayed payments on contract የኮንትራት ክፍያዎች መዘግየት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF19	Financial failure of the contractor የኮንትራክተሩ የገንዘብ አጦት /አጥረት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF20	Unmanaged cash flow ተገቢ አያያዝ ያላገኘ የገንዘብ ፍሰት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF21	Exchange rate fluctuation የምንዛሬ መዋገፍ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF22	High interest rate ከፍተኛ የወለድ መጠን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<b>FID</b>	<b>Factors (ስጋቱን/ተጸዕኖዉን የሚያመጡ/የሚያስከትሉ ምክኛቶች)</b>	Affects projects (ተጸእኖ ያመጣል)		Severity የስጋቱ(risk) ክብደት		
			Yes	No	1	2	3
RF23	Minimum amount interim of payment ዝቅተኛ የሆነ ጊዜያዊ ክፍያ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

<b>Legal</b> <b>ሀጋዊነት</b>	RF24	Difficulty to get permits ፍቃድ የማግኘት ችግር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF25	Ambiguity of work legislations የአሰራር/የሰራ ህግ አሻሚ መሆን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF26	Legal disputes during the construction phase በግንባታ ወቅት የሚፈጠሩ በህግ የሚያዙ ክርክሮች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF27	Delayed disputes resolutions የዘገዩ ውሳኔዎች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF28	No specialized arbitrators to help settle fast በፍጥነት ችግሮችን የሚፈቱ የግልግል ዳኞች አለመኖር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Construction</b> <b>የግንባታ ስራ/</b> <b>ኮንትራክሽን</b>	RF29	Rush bidding በችኮላ የሚካሄድ የጨረታ ሂደት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF30	Unrealistic Project Schedule ከእዉነታዉ የራቀ የፕሮጀክት የስራ መርሃ ግብር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF31	Undocumented change orders ሰነድ አልባ የለዉጥ ተዕዛዞች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF32	Lower quality of work ዝቅተኛ የስራ ጥራት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF33	Changes in design የዲዛይን ለዉጥ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF34	Difference in actual and contract executed quantities በውል የተያዘውና መሬት ላይ ያለው አፈጻጸም ልዩነት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<b>FID</b>	<b>Factors (ስጋቱን/ተጻዕኖዉን የሚያመጡ/የሚያስከትሉ ምክኛዎች)</b>	<b>Affects projects(ተጽእኖ ያመጣል)</b>		<b>Severity የስጋቱ(risk) ክብደት</b>		
		Yes	No	1	2	3	
RF35	Lack of qualified & competent professionals በሙያዉ የተማረና ብቃት ያለዉ ባለሙያ እጥረት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

	RF36	High project complexity የፕሮጀክቱ ውስብስብ መሆን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Political</b> <b>ፖለቲካዊ</b>	RF37	Change of government የመንግስት ለውጥ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF38	Change of government policy የመንግስት ፖሊሲ ለውጥ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF39	New governmental acts or legislations አዳዲስ የመንግስት ህጎችና ድንጋጌዎች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Management</b> <b>አስተዳደራዊ</b>	RF40	Ambiguous planning due to project complexity በፕሮጀክት ውስብስብነት ምክንያት አሻሚ ዕቅድ ማወጣት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF41	Resource management የንብረት አስተዳደር/አጠቃቀም	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF42	Changes in management ways የአስተዳደር የአሰራር ለውጦች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF43	Information unavailability (include uncertainty) የመረጃ አለመኖር/አለመገኘት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF44	Poor communication between parties involved በሚመለከታቸው (ባለ ድርሻ) አካላት መካከል ደካማ ግንኙነት መኖር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Part II: 2- Remedial Methods የማስተካከያ/የመከላከያ ዘዴዎች**

2. In the table shown below, please determine the relative use of each preventative method.

		Never በጭራሽ	Rarely አልፎ አልፎ	Sometimes አንዳንዴ	Often ብዙ ጊዜ	Always ሁል ጊዜ
	<b>Preventative Method የመከላከያ ዘዴ/የመቆጣጠሪያ መንገድ</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
RM 1	Utilize quantitative risk analyses techniques for accurate time ለትክክለኛው ወቅት አሃዛዊ የስጋት ትንተና ዘዴዎችን መጠቀም	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 2	Depend on subjective judgment to produce a proper program. ተገቢ ፕሮግራም ለማዘጋጀት ግለሰባዊ ድምዳሜን መሠረት አድርጎ መስራት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 3	Produce a proper schedule by getting updated project information ወቅታዊነት ያለው የፕሮጀክት መረጃን መሰረት በማድረግ ተገቢ የአፈጻጸም ጊዜ ሰሌዳ ማዘጋጀት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 4	Plan alternative methods as stand-by. አማራጭ ዘዴዎችን ለተጠባባቂነት ማቀድ፤	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 5	Reduce Risk ስጋትን መቀነስ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 6	Transfer or share risk to/with other parties ስጋትን ለሌሎች ወገኖች ማስተላለፍ ወይም ማጋራት	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RM 7	Avoid risk ስጋት ከመከሰቱ በፊት ማስወገድ					
RM 8	Refer to previous and ongoing similar projects for accurate ለትክክለኛ የመከላከል እርምጃ የተጠናቀቀና በመከናወን ላይ ያሉ ፕሮጀክቶችን ተመልሶ ማየትና ማስተያየት፤	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**3. In the table shown below, please determine the relative use of each mitigation method.**

		Never በጭራሽ	Rarely አልፎ አልፎ	Sometimes አንዳንድ	Often ብዙ ጊዜ	Always ሁል ጊዜ
	Remedial Method ( የማስታገሻ ዘዴ)	1	2	3	4	5
MM1	Increase Manpower and/or equipment የሰው ሃይልና የስራ መሳሪያዎችን መጨመር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MM2	Increase the working hours የስራ ሰዓቱን መጨመር	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MM 3	Change the sequence of work by overlapping activities ተግባራትን በመደራረብ የስራውን ቅደም ተከተል መለወጥ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MM 4	Coordinate closely with subcontractors ከንኡሳን ተቋራጮች ጋር ስራውን ማስተባበር/ መናበብ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MM 5	Close supervision to subordinates for minimizing abortive work ስራን የሚያስተዳግሉ/የሚያጨነግፉ ሁኔታዎችን ለመቀነስ የበታች	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ሰራተኞች ላይ የቅርብ ክትትል ማድረግ						
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**Part II: 3- Risk Analysis Techniques**

4. The table below contains some techniques used in risk analyses. Please assign the relative use of each technique.

	Never በጭራሽ	Rarely አልፎ አልፎ	Sometimes አንዳንድ	Often ብዙ ጊዜ	Always ሁል ጊዜ
Risk Analysis Technique የስጋት ትንተና ቴክኒክ	1	2	3	4	5
Expert Systems (including software, decision support systems computer based analysis techniques such as @Risk የስጋት ትንተናና ወሳኔ ሙያዊ ድጋፍ የሚያቀርቡ የኮምፒውተር ስራዓቶች መጠቀም	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Probability Analysis(analyze historical data) ካሁን ቀደም የነበሩ መረጃዎችን በመተንተን የስጋቶችን የመከሰት ዕድል/አጋጣሚ መተንተን	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sensitivity analysis(on time, budget & quality) የተጓዳኝ ተጽእኖ ትንተና ማካሄድ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Simulation analysis using simulator computer packages የተመሳሳይ ሁኔታዎች ትንተና የሚያደርጉ ኮምፒውተር ፕሮግራሞችን በመጠቀም የተጽእኖ ትንተና ማድረግ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Direct judgment using experience and personal skills የግል ተሞኮሮንና ክህሎትን በመጠቀም	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	ቀጥተኛ ብያኔ መውሰድ					
	Comparing Analysis (compare similar projects through similar conditions...የተመሳሳይ ፕሮጀክቶችን ቁመና በማየት የንጽጽር ትንተና ማካሄድ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>