ST.MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

ASSESMENT OF PROJECT RISK MANAGEMENT PRACTICES IN ETHIOPIAN ROAD AUTHORITY

BY

YOHANNES ABERA TESFAYE

JUNE 2020

ADDIS ABABA, ETHIOPIA

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APPROVED BY BOARD OF EXAMINERS

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DECLARATION

I Yohannes Abera Tesfaye declare that this MA thesis is the result of my own work. Thesis does not contain information or data acquired illegally and was not submitted earlier to St Mary's University or any other University/institute.

Yohannes Abera Tesfaye

Signature: _____

Date: __June 2020_____

St. Mary's University, Addis Ababa

ENDORSEMENT

This thesis is submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

Advisor: Muluadam Alemu (PhD)

Signature: _____

Date: _____

St. Mary's University, Addis Ababa

ACKNOLEDGMENT

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ACRONOMYS

ERA……...Ethiopian Road Authority

ISO…….International Organization for Standardization

PMI……Project Management Institute

RII…….....Relative Importance Index

SPSS……..Statistical Package for Social Sciences

SWOT……Strength Weaknesses Opportunities and Treats

US……..United States

ABSTRACT

The main objective of this paper is to assess the project risk management practice Ethiopian Road Authority. The study type was a descriptive study and the design used was purposive sampling technique to take the sample size of eighty six respondents. A questionnaire was developed to collect primary data from the employees. The questionnaire consists about general risk management practices, risk identification, risk analysis, risk monitor and control, sources of risks and their probability of occurrence and the impact of risks on quality, cost and time. The finding of the research indicated the risk identification methods mostly used are expert judgment, document review, information gathering and checklist analysis. The source of risk encountered in projects is financial and technical sources. The result on risk analysis shows the methods used are expert judgment and risk categorization. Risks that are occurred during the project work didn't reviewed, monitored and controlled periodically and appropriately. As per RII results financial, material risks, construction, design and technical risks are the major risks on project quality, cost and time. The study recommended ERA to form risk management department/responsible body to manage a risk occurred properly with risk management process. Additionally all the risk identification, analysis, monitoring and control should be applied as per the guideline.

Key words: ERA, Risk Management, Sources of Risk

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Project risk is an uncertain event or condition that, if it occurs, will cause a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality (Project Management Institute [PMI], 2013). According to the PMI (2013), project risk management is one of the nine most critical parts of project commissioning. This indicates a strong relationship between managing risks and a project success.

The most important definition of Risk Management is stated by PMI (2013) which defines risk management as systematic processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project. The main aims of project risk management are to increase the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project. A good risk management procedure or process will support better decision-making concerning risk, at the same time there will be a better understanding of the risks, how these risks will affect the project and the responses to these risks if they should occur.

Project Risk Management includes the process of conducting risk management planning identification, analysis, response planning and implementation and monitoring of risks throughout the project. The main aim of project risk management are to increase the probability and impact of positive risks and to decrease the probability and impact of adverse risks, in order to optimize the chances of project success (PMI 2017).

Since the process of taking a project from initiation to completion and bringing it into operation is a complex process, the construction industry is subject to more risk and uncertainty than many other industries (Flanagan and Norman, 1993). According to Flanagan and Norman ERA may suffer a lot of risks and uncertainties because it undertakes a lot of construction projects specifically road projects.

As a key public institution that administers almost all the road infrastructure in the country. Many projects have been implemented by ERA with the aim to facilitate access to road services

for all people in the country. Though a number of projects were implemented by ERA across the country, designing and implementing such projects is characterized by both positive and negative risks. This has enormous effects on ERA's long term vision of developing and managing sustainable roads through institutional competency and optimal resource utilization despite this there is limited endeavor to assess the project risk management practices in ERA. The main purpose of this study is therefore to investigate the effectiveness of project risk management practices in ERA.

1.2 Background of the Organization

The Ethiopian Roads Authority (ERA) has been given the mandate for the restoration expansion and maintenance of Ethiopian's Federal road network. Its goal is to improve transport operating efficiency and reduce road transport costs, provide access to rural, neglected and food-deficit areas and develop institutional capacity of the sector. As such ERA is vital to the economy of the country, and its own efficiency and performance plays an important part in the development of the country. The vision of the Authority is see Global competency and great roads to prosperous Ethiopia by 2030 and its mission is to develop and manage sustainable roads through institutional competency and optimal resource utilization.

1.3 Statement of the Problem

If an organization needs to be successful on projects, it should be dedicated to address risk management proactively and consistently throughout the project. A conscious choice should be made at all levels of the organization to actively identify and pursue effective risk management during the life cycle of the project. According to PMI (2013, project risk could exist at the moment a project is initiated. Moving forward on a project without a proactive focus on risk management is likely to lead to more problems arising from unmanaged threats.

Currently, Ethiopia is investing billions of birr to construct road infrastructures throughout the country in order to satisfy people needs. So, Ethiopia is becoming obligated to undertake different road construction projects. Therefore the successful completion and operation of the road construction projects is a very significant and great achievement to the country.

Smith, Merna and Jobbling (2006) outlined that at the completion of each phase in the project life cycle there is a decision point where risk assessment takes place and based on the risk assessment, an appropriate decision is made regarding further actions or proceeding to the next phase.

Moreover, to complete successfully a road construction projects, like any other projects, strong follow up should be given to the overall project risk management and the project organization should be committed to address risk management proactively and consistently throughout the projects. As well as attentive and watchful risk management practices should be made at all levels of the organization to actively identify risks and follow effective risk management during the life cycle of the projects.

Asper to Flanagan *et al.* (1993) the process of taking a project from initiation to completion and bringing it into operation is a complex process, the construction industry is subject to more risk and uncertainty than many other industries by its nature. The road sector in Ethiopia constitutes one of the major spending in the country item succeeding to educational allocations. Despite this most of the road projects run by ERA are not completed within the budget, time, scope and quality due to failure either to prepare or implement project risk management plans properly. The same is true for ERA Road projects; they are not completed within the allocated time, budget, quality and scope. Failure to effectively identify and implement risk management plan has been one of the drawback in road project management by ERA. As a result of this the researcher assumed that there is a gap in the effectiveness of the project risk management practices of ERA. Therefore, the proposed study aims to assess the project risk management practices of ERA that gives important lessons and recommendations to make for future project endeavors.

1.4 Research questions

The study has addressed the following questions with evidence.

- How does a project risk management practiced look like at ERA?
- What are the process projects risks are identified in ERA?
- What are the tools used to analyze risks in ERA?

- How risks are monitored and controlled in ERA?
- What are the major types of risks experienced on road construction that are undertaken by ERA?

1.5 Research Objective

1.5.1 General objectives

The general objective of this study is to assess the project risk management practices in ERA.

1.5.2 Specific objectives

- To assess how risk management is practiced in ERA.
- Assessing the process in identifying risks in ERA.
- Identifying tools used to analyze risks in ERA
- Identifying how risks are monitored and controlled in ERA
- Assessing and identifying the major types of risks occurred during road construction projects by ERA and ranking the risks based on their probability of occurrence and the effect on the project objectives.

1.6 Significance of the study

The endeavors of the research have the following theoretical and practical significances

1.6.1 Theoretical significance

The study may be used as a reference material to students and academic community in their effort to explore or identify project risk management practices in general on road construction organization and more specifically in the context of Ethiopian Road Authority.

1.6.2 Practical significance

The study is aimed to assess project risk management practices of ERA and to identify the major risk occurred and suggests alternative actions to be taken in order to alleviate the major short

comings. The findings and recommendations of the study will then be used as optional approach to increase effectiveness of project risk management process in the case of ERA. The study could also provide general view and reference to those interested in making further study on the same issue.

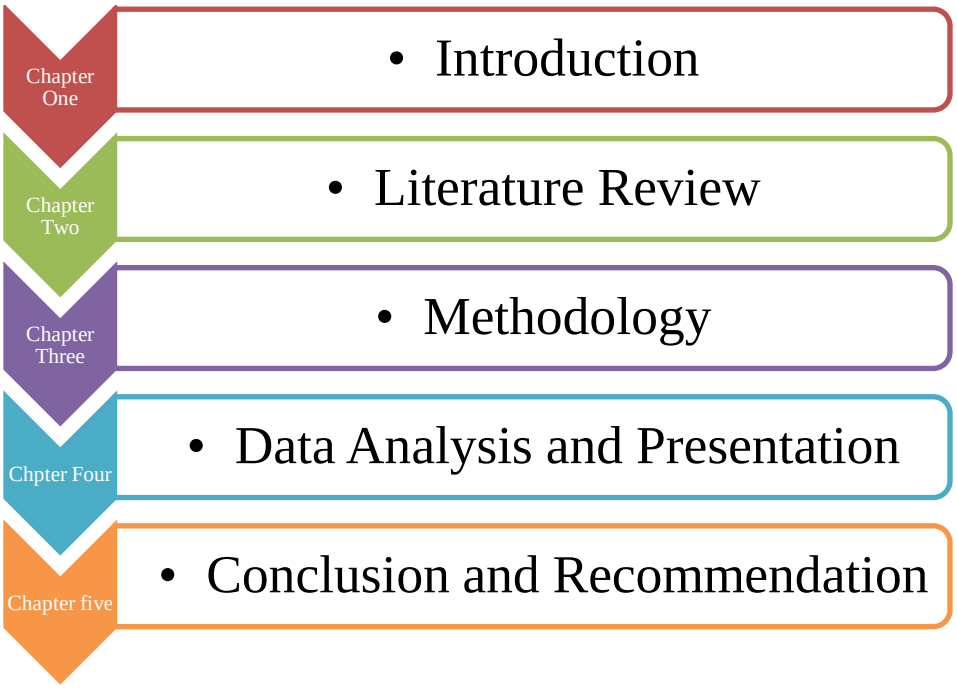
1.7 Scope of the Study

This study focuses on assessment of project risk management practices in ERA. The study delimited at the head office on a selected groups that are relatively related to risk management. It is also delimited with respect of objective as it has only specifically assessed the practice of project risk management. The study also faces challenges on gathering of data because of the pandemic situation.

1.8 Organization of the paper

This study is organized in to five chapters. The first chapter incorporates the background of the study, statement of the problem, research questions, and objectives of the study, significance of the study, scope and limitation of the study, and organization of the paper. In the second chapter presents the literature review. Third chapter is about the methodology of the study in which data type and source, research procedure, method of data collection and method of data analysis are presented. The fourth chapter is about data presentation, analysis and interpretation. Finally, the fifth chapter deals with the conclusion and the recommendation.

Figure 1-1 Organization of the Paper



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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this section literatures that are related with the research work are discussed. The theoretical and conceptual literatures related to the concepts of Risk and Uncertainty, Sources of risks, Risk classification and Risk Management in road projects are discussed. Furthermore, previous studies on Project Risk Management that provide Empirical foundations are compared and elaborated with comparison of findings.

2.2 Risk and Uncertainty

Risk can be defined as an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project objective. A risk has a cause and, if it occurs, a consequence (Office of project management process improvement, 2003). Jaffari (2001) defined risk as the exposure to loss/gain, or the probability of occurrence of loss/gain multiplied by its respective magnitude. Events are said to be certain if the probability of their occurrence is 100% or totally uncertain if the probability of occurrence is 0%. In between these extremes the uncertainty varies quite widely.

The International Organization for Standardization [ISO], (2009) defines risk as an effect of uncertainty on objectives and is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence.

Project risk is an uncertain event or condition that, if it occurs, will cause a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality (Project Management Institute [PMI], 2013).

According to Hilson (2001) risk is an umbrella term, with two varieties: opportunity which is a risk with positive effects and threat which is a risk with negative effects. On the other hand uncertainty is the overarching term, with two varieties: risk referring exclusively to a threat, i.e. an uncertainty with negative effects and an opportunity which is an uncertainty with positive effects.

Uncertainty is a situation in which a number of possibilities exist and which of them has occurred, or will occur, is unknown. Considering all risks are uncertain but not all uncertainty is risky (Yoe, 2000). Risks and uncertainties characterize all activities in production, services and exchange. They affect all the fundamental variables that determine planning, implementation, monitoring, adjustment, behavior and explain choices, and bring about decisions (Okema, 2001).

Uncertainty is express in terms of an events probability of occurrence. If the probability of occurrence of an event is 100%, then it is termed to be certain. On the other hand a probability occurrence recorded as 0%, means the event is uncertain. There exist a huge gap of uncertainty between the limit of 0% and 100% (Jaafari, 2001).

Uncertainty makes it difficult to have an exact outlook of future possibilities. To manage uncertainty effectively, the variability and ambiguity nature of uncertainty needs to be differentiated. A situation of usage where a measurable factor takes a unit of set of possible values describes its variability nature. Ambiguity situation is considered when there is no complete knowledge in relation to the situation being reviewed. (Hillson and Murray-Webster, 2007).

Table 2-1: Definition of impact scales for four project objectives

Defined Conditions for Impact Scales of a Risk on Major Project Objectives					
Project Objective	Relative of numerical scales are shown				
	Very low/.05	Low/.10	Moderate/.20	High/.40	Very high/.80
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% Cost increase	>40% cost increase
Time	Insignificant time increase	<5% time increase	5-10% time increase	10-20% time increase	>20% time increase
Scope	Insignificant	Minor areas of	Major areas	Scope	Project end

	scope increase	scope affected	of scope affected	reduction unacceptable to sponsor	item is effectively useless
Quality	Insignificant quality increase	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

Source: PMI (2013)

2.2.1 Dynamic and Static Risks

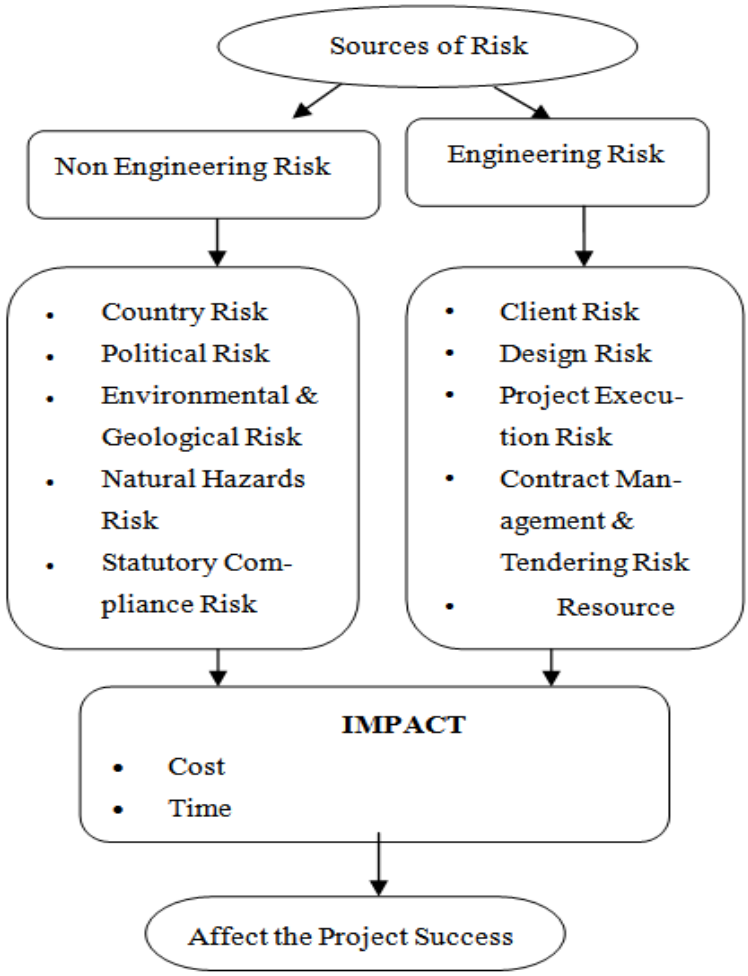
Dynamic risk is concerned with making opportunities; for instance it might concern developing a new and innovative product. Dynamic risk means that there will be potential gains as well as losses. Dynamic risk is risking the loss of something certain for gain of something uncertain (Flanagan & Norman, 1993; NAO, 2001).

Static risk related only to potential losses where people are concerned with minimizing losses by risk aversion (Flanagan & Norman, 1993). The unsystematic and arbitrary management of risks can endanger the success of the project since most risks are very dynamic throughout the project lifetime (Baloi & Price, 2003).

2.3 Sources of risks

Risks in project management can come from different sources. Education and Learning Wales, (2001) indicated the following as sources of risks: Environmental risks, Political risks, Social risks, Financial risk, Legal risks, Technological risks, Commercial risk, Communications risks, Geographical risks, Management risks, Geotechnical risks, Construction risks, Operational risks, and Demand/product risks.

Figure 2-1: Sources of risk



Source: Renuka *et al*, (2014)

2.4 Project Risk Classification

Risks can be divided into different types or classifications or categories, the important aspects of these are as follows:

- Known risks: these risk events are frequently occurring in all construction projects and are inevitable, thus including minor fluctuations in material costs and productivity (Smith *et al.*, 2006). It is the cognitive condition of risk, where the identification of the risk source has been made and the probability of occurrence regarding the risk event has been assigned (Winch, 2010).

- Known unknowns: these risk events are somewhat predictable meaning there is some knowledge regarding either the probability of occurrence or their effect (Smith *et al.*, 2006). It is the cognitive condition of uncertainty, where at least the risk source has been identified.
- Unknown unknowns: it is the cognitive condition of uncertainty in which somebody might have knowledge about the risk source and probabilities but keeps the information private. The risk source is not identified and the risk event can therefore not be known (Winch, 2010). Thus, these risk events are incidents, whose effect and probabilities of occurrence are unforeseeable, even by the most knowledgeable and experienced members of a project (Smith *et al.*, 2006).

2.5 Risk Management

The Institute of Risk Management (IRM) states that risk management (RM) is a rapidly developing discipline with no clear viewpoints or consensus on what is involved in risk. The IRM identifies risk as having two dimensions: positive and negative. Positive risks could have positive impacts on the success of a project, and negative risks are associated with the possible failures of a project (IRM, 2002).

Risk Management is a logical, systematic and process oriented approach that: minimizes losses and maximizes opportunities through enabling improvements in decision making; and establish the context for risks involved in any activity or process that need to be identified, analyzed, treated and monitored (Wubshet, 2006).

The Project Management Institute (PMI), which is the largest professional organization dedicated to project management, described as: "the systematic process of identifying, analyzing and responding to project related risks" (Project Management Institute Standards Committee, 2000, p.127). According to Cooper *et al.*, (2005), the main purpose of risk management is to identify and manage significant risks.

Further, in most projects the risk management process is coordinated with other management processes (Cooper *et al.*, 2005). In wider perspective, according to the Project Management Institute (2000), project risk management is an important and valuable component of project management and it can improve the value of other project management process. Further, project risk management

should not be an optional activity in the project management thus it is essential to achieve a successful project management (PMI, 2000)

2.6 Project Risk

Project risk is an uncertain event or condition that, if it occurs, will cause a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality (PMI, 2013).

2.7 Project Risk Management

According to the PMI (2013), project risk management is one of the nine most critical parts of project commissioning indicating a strong relationship between managing risks and a project success. PMI (2013) defined project risk management as a systematic process of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project having an objective of increasing the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project. According to International Marine Contractors Association (2006) project risk management is a five step process by which the likelihood of risk occurring or its impact on a project is reduced. The five steps involved in the process are identifying the potential sources of risk on the project, determining their individual impact and selecting those with a significant impact for full analysis, assessing the overall impact of significant risks, determining how the likelihood or impact of risk can be reduced and finally develop and implementing a plan for controlling the risks and achieving the reductions.

2.7.1 Project Risk management Process

The PMI (2013) identifies the six major steps of the project risk management process.

- Identify Risks: having the benefit of documenting existing risks and the knowledge and ability it provides to the project team to anticipate events, this step is the process of determining which risks may affect the project and documenting their characteristics. The project manager, project team members, risk management team (if assigned), customers, subject matter experts from outside the project team, end users, other project managers, stakeholders, and risk management experts are the major participants in risk identification activities. Documentation reviews, information gathering techniques (like brainstorming,

Delphi technique, interview and root cause analysis), checklist analysis, assumptions analysis, diagramming techniques (like cause and effect diagrams, influence diagrams and process flow charts), SWOT analysis and expert judgment methods can be applied to identify risks in a project undertaking.

- Perform Qualitative Risk Analysis: having the benefit of enabling project managers to reduce the level of uncertainty and to focus on high-priority risks, this step focuses on prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact. This step assesses the priority of identified risks using their relative probability or likelihood of occurrence, the corresponding impact on project objectives if the risks occur, as well as other factors such as the time frame for response and the organization's risk tolerance associated with the project constraints of cost, schedule, scope, and quality. Risk Probability and Impact Assessment, Probability and Impact Matrix, Risk Data Quality Assessment, Risk Urgency Assessment, Risk Categorization and Expert Judgment are the key types of methods used to asses risks qualitatively.

- Perform Quantitative Risk Analysis: is the process of numerically analyzing the effect of identified risks on overall project objectives. The advantage of this process is that it produces quantitative risk information to support decision making in order to reduce project uncertainty. It is on risks that have been prioritized by the qualitative risk analysis process as potentially and substantially impacting the project's competing demands. The Perform Quantitative Risk Analysis process analyzes the effect of those risks on project objectives. It is used mostly to evaluate the aggregate effect of all risks affecting the project. The most common methods used to perform quantitative risk assessment include Data Gathering and Representation Techniques (like probability distributions and interview), Quantitative Risk Analysis and Modeling Techniques (like sensitivity analysis, expected monetary value analysis and modeling & simulation) and expert judgment techniques.

- Plan Risk Responses: is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives.

- Control Risks: is the process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project. Risk Avoidance, Transference, Mitigation and Acceptance are the four major strategies which are used to deal with risks that may have negative impacts on project objectives if they occur. These strategies should be chosen to match the risk's probability and impact on the project's overall objectives. Avoidance and mitigation strategies are usually good strategies for critical risks with high impact, while transference and acceptance are usually good strategies for threats that are less critical and with low overall impact.

2.8 Construction Risk

The construction industry can be described as the sum of all economic activities related to civil and building works: their conception, planning, execution, and maintenance. Such works normally comprise capital investment in the form of roads, railways, airports, ports and maritime structures, dams, power generating stations, irrigation schemes, health centers and hospitals, educational institutions, warehouses, factories, offices and residential premises (Tecle & Mahelet, 2009).

There are several major classifications of construction that differ markedly from one another: housing, nonresidential building, heavy, highway, utility, and industrial. Construction projects include new construction, renovation, and demolition for both residential and nonresidential projects, as well as public works projects, such as streets, roads, highways, utility plants, bridges, tunnels, and overpasses (Keoki, Sears & Clough, 2008).

There are a lot of risks that can be identified in the construction industry that are faced on the construction project size and scope. Changes in design and scope along with time frames for project completion are the most common risks for the construction sector. The further in the process, changes in scope or design are implemented, the more additional resources, time and cost, those changes require. Project completion ahead of time may be as troublesome as delays in a schedule. Too quick completion may be a result of insufficient planning or design problems which in fact shorten the completion time but on the other hand lead to a low quality of final

product and increased overall cost. Being behind schedule generates greater costs for both investors and contractors due to non-compliance with contracted works (Gould & Joyce, 2002).

2.8.1 Risks in Construction Projects

The construction industry is heterogeneous and enormously complex. There are several major classifications of construction that differ markedly from one another: housing, nonresidential building, heavy, highway, utility, and industrial. Construction projects include new construction, renovation, and demolition for both residential and nonresidential projects, as well as public works projects, such as streets, roads, highways, utility plants, bridges, tunnels, and overpasses (Keoki, Sears & Clough, 2008).

Ewelina and Mikaela (as cited in Smith, Merna and Jobbling, 2006) outlined that at the completion of each phase in the project life cycle there is a decision point where risk assessment takes place and based on the risk assessment, an appropriate decision is made regarding further actions or proceeding to the next phase.

Nerija and Audrius (as cited in Institution of Civil Engineers and the Actuarial Profession, 2005) discussed that risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives having the benefits of identifying and analyzing risks, and improvement of construction project management processes and effective use of resources.

According to Zou, Zhang and Wang (2007) construction projects can be unpredictable and managing risks in construction projects has been recognized as a very important process in order to achieve project objectives in terms of time, cost, quality, safety and environmental sustainability. Project risk management is an iterative process: the process is beneficial when is implemented in a systematic manner throughout the lifecycle of a construction project, from the planning stage to completion.

Ebrahimnejad, Mousavi and Mojtahedi (2008) developed an extensive risk breakdown structure for construction projects in developing countries in Asia, mainly Iran to indicate the major risks faced by construction projects. The risk structure shows the risk groups, risk categories, and risk events at the

lowest work breakdown structure level. The researchers divided project risks into five initial groups namely; Management, Engineering, Procurement, Construction, and Commissioning.

Another interesting risk classification is the one outlined by IMCA (2006) which classifies construction project risks into five major categories according to where control of the risk event lies. They are:

- External: Unpredictable

These are risks beyond the control of the individual or operator and are totally unpredictable. They arise from external influences such as third parties, acts of god, etc.

- External: Predictable but Uncertain

These risks are also beyond the control of individuals or companies. They are expected, but to what extent they are going to happen is uncertain. There is usually data to determine an average, but the actual impact can be more or less than this average. Bad weather is an example.

- Internal: Technical

These are risks arising directly from the technology of the project work, of the design, construction or operation of the facility.

- Internal: Non-Technical

These are within the control of individuals or the operator and usually arise from a failure of a project team to achieve its expected performance. They may result in schedule delays, cost over-runs or an interruption to cash flow.

- Legal: Civil and Criminal

These are risks arising from the civil or criminal law of a country. Risks under civil law can arise from contractual arrangements, patent rights etc. Risks under criminal law can arise under specific decrees or bill of laws.

According to Krantikumar, Konnur and Amarsinh (2016), risks associated with the construction industry can be broadly categorized into seven major categories and are discussed below:

- Technical Risks: the risks associated with inadequate specification, inadequate site investigation, change in scope, construction procedures and insufficient resource availability etc. are termed as technical risks.

- Construction Risks: these are the type of risks associated with labor productivity, labor disputes, site condition, equipment failures, too high quality standard and new technology.

- Physical Risks: the risks arising from the damage to structure, damage to equipment, labor injuries, equipment & material fire and theft etc. are known as physical risks.

- Organizational Risks: the organizational risks consist of contractual relations, contractor's experience, and attitude of project participants, inexperienced work force and communication.

- Financial Risks: increased material cost, low market demand, exchange rate fluctuation, payment delays and improper estimation taxes etc. are related to financial risks.

- Socio-Political Risks: are risks associated with changes in laws and regulations, pollution and safety rules, bribery/corruption, language/cultural barriers, law & order, war and civil disorder and requirement for permits and their approval.

- Environmental Risks: includes natural disasters and weather implications.

2.9 Risks on Road construction projects

Road construction project risks are interrelated but interdependent. The customary origins for project risks are the following (U.S. Department of Transportation, 2006) Performance, scope, quality, or technology issues; Environment, safety, and health concerns; Scope, cost, and schedule uncertainty; Political concerns. Risk will be peculiar to each particular project and each project participant, however, it is recognized that all construction projects share common risks that can be classified

- Changes in the work, Subsurface geological and geotechnical conditions,
- Site access, Level of detail design delivered by the owner,
- Late drawings and instructions, Availability of resources, Accidents (such as collision, fire) Damage to persons or property,
- Defective design, Cost of tests and samples, Actual quantities of work,
- Equipment commissioning, Financial and economic, Inflation and Funding,
- Performance productivity of labor, Productivity of equipment,
- Suitability of materials, Defective work, conduct hindering performance of the work, Labor disputes.

The U.S Department of Transportation (2006) adopts the following risk organization structure: Technical risks, design process, owner involvement in design, Inadequate and incomplete design, change in seismic criteria, Errors in completion of structural / geotechnical / foundation, wrong selection of materials, take off data (traffic demand, water consumption demand, etc.), Need for design exceptions construction risks, Inaccurate contract time estimates, Construction procedures, Construction occupational safety, Work permissions, Utilities, Late surveys, incomplete or wrong, Delayed deliveries and disruptions, Worker and site safety, Innovative projects, Unsuitable equipment and materials, Environmental risks (such as projects close to a river, floodplain, coastal zone, high habitat sensitivity, and so on)

External risks, contractual relations, landowners unwilling to sell, priorities change on existing program, Funding changes for fiscal year, stakeholders request late changes, new stakeholders, additional needs requested by stakeholders, new information required for permits, Inconsistent costs, time, scope, and quality objectives, Permits and licenses.

Force majeure factors, political factors change (political interference), economic instability, market conditions, exchange rate fluctuation, public safety regulation

Social factors, local communities pose objections, environmental factors, environmental regulations change, water quality issues, new information required for permits, environmental impact statement required historic site, endangered species, or wetlands present, pressure to compress the environmental schedule.

Organizational risks, inexperienced staff assigned, losing critical staff at crucial points of the project, insufficient time to plan, unanticipated project manager workload, not enough time to plan, priorities change on existing program, inconsistent cost, time, scope, and quality objectives

Project management risks, project purpose definition, needs, objectives, costs, deliverables are poorly defined or understood, no control over staff priorities, too many projects, consultant or contractor delays, estimating and/or scheduling errors, communication breakdown with project team, lack of coordination / communication, inexperienced workforce / inadequate staff / resource availability.

It is important to capture all potential risks in a project and undertake all necessary actions or make provisions for eliminating or preventing them from occurring. Alternatively, the effects of risks may be reduced and allocated to the party best prepared for managing them. This requires a systematic approach to risk management.

2.9.1 Road Construction Projects Risk Management

Road construction risk management is a concept which should be managed in early stage of a project. Companies often establish a construction risk management procedure in their projects for improving the performance and increase the profits of Projects undertaken. In road construction sector are widely complex and have often significant budgets, and thus reducing risks associated with must be given priority, for each project actors that go with success parameters of project in time completion, within specific budget, requested performance and technical requirement. Road construction projects can be unpredictable and managing risks in construction projects recognized very important process in order to achieve project objectives in terms of time, cost, quality, safety, and environmental sustainability (Zou- *et al.*, 2007).

According to (Flanagan and Norman 1993), the road construction industry is subject to more risk and uncertainty than many other industries. The development of a construction project from inception to completion takes long time and involves many phases. Road construction projects are sensitive to an extremely large matrix of hazards and risks, due to some of the inherent characteristics of construction projects, which can be summarized by (Bunni, 2003) as follows,

- Time required to complete road construction project is comparatively high.

- Human resource requirement is diverse and changes over time and from phase to phase.
- Projects location/ geographically dispersed and sometimes situated in isolated regions of difficult terrain.
- Large diverse pool of materials required with advanced and complex technology and extensive interaction among the parties involved in construction lead to team work and inherent conflicts.

All parties involved in road construction project must accept that there is some risk attached to their activities. If one cannot control a risk through a business practices or transfer that risk to someone else through an indemnification clause, then the risk can be managed that risk through insurance (Ratterman, 2003). Some risks have enormous size in financial terms and the party to whom a risk is allocated may want to cover it by means of insurance (Akbiyikli, 2012).

Construction project parties, whether they are the owner, contractor, engineer or supplier, can protect their interests by insurance but must accept that not all risks are insurable (ERASMEC, 2008). Insurance is not the only means by which risks associated with construction and infrastructure projects may be addressed, however, it is one of the principal means by which parties to major projects treat risk.

2.9.2 Road Construction Industry in Ethiopia

According to Wubishet; (2004), the level of Performances in the Public Construction Projects in Developing Countries the Case in Ethiopia is described that modern Construction Industry in Ethiopia started during the reign of Emperor Minilik II who is well known for the Government of the Modern Ethiopian State. At that time, Asphalt Road constructed from Addis Ababa to Asmara (Wubishet, 2004). It described that Italy during its invasion (1936-1941), had contributed for the development of Construction Industry, especially on the road sector in which case about 6000 km road networks constructed.

The Ethiopian Roads Authority (ERA) administrates the road construction industry is the largest road construction employer in the country. There are number of local and foreign contractors and consultants participating in design, construction, and maintenance of road projects. Ethiopia, being the least developing country and few studies made (SMEC. 1999; -EACE. 2003) indicates

Ethiopia it shares most of the common characteristics of the Construction Industry experiential in other developing countries.

2.9.3 Capacity of the construction industry in Ethiopia

The study by Siemens manufacturing and Engineering Center (SMEC) concluded that the general state of the industry is very low (SMEC, 2000). This current status of the industry is resulted from the past economic policies in which the industry was not considered as an independent sector. And the following features characterize the National Construction Industry, lack of clear economic objectives for the industry; Inadequate coordination of planning between the industry and the infrastructure programs in the various sectors of the economy heavily dependence on foreign resources such as equipment, materials and expertise to be supplied by foreign contractors and consultants; transportation problems for the distribution of construction materials and equipment; irrelevant local construction standards, and regulation; inadequate and ineffective organizations representing the interests of contractors, consultants and unnamed factors (SMEC, 2000)

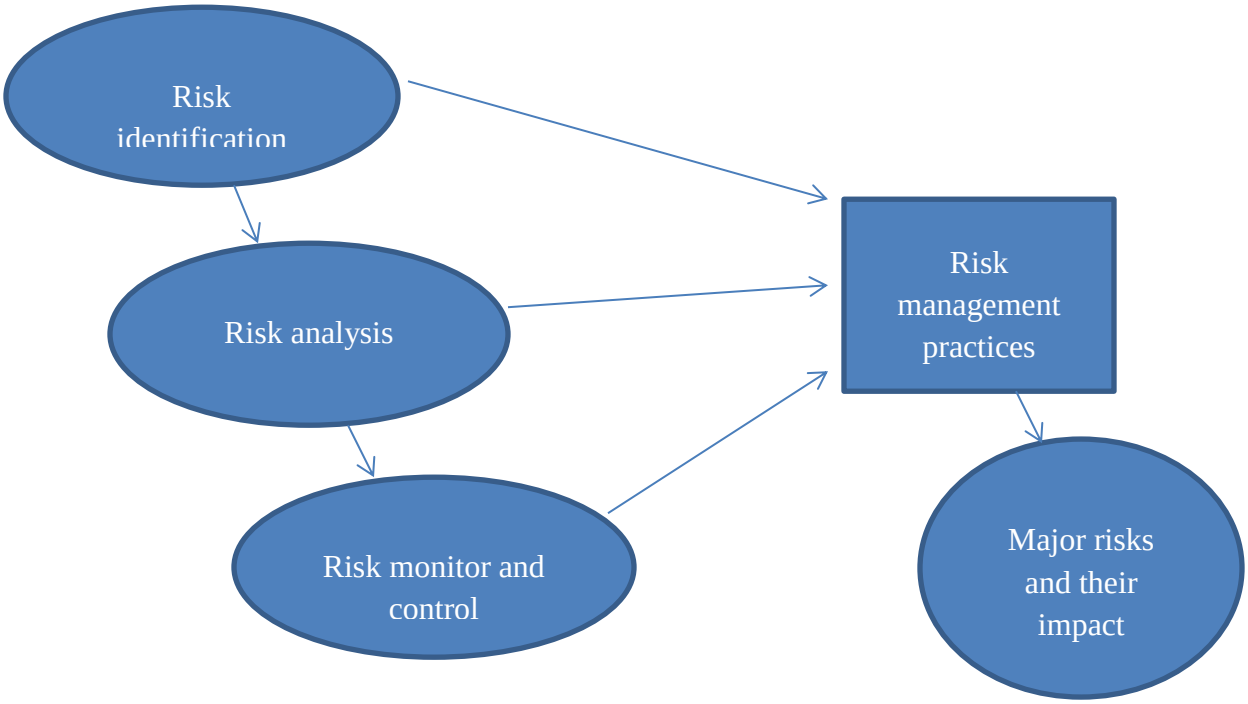
The study of Wubishet while assessing the capacity of the local construction industry to the country identified various problems in relation to scarcity of materials, weak organizations and poor information management system. (Wubishet, 2004) according to his study, almost all resources in the country are scares. Besides, finance, machinery and technology are highly dependent on foreign sources and there is also inappropriate perception and policies together with huge foreign dependencies worsen the scarcity.

Stakeholders of road sector also described in the consultative meeting held among them through ERA that finance is the basic problem of the industry, especially for local contractors in the sector. The described financial incapability with respect to the problems associated that inaccessibility of construction equipment and machineries and the amounts of contract guarantees. Because financial institutions are not capable to support the industry and there is no culture of working and growing together in local contractors.

2.10 Conceptual Framework

The research will mainly focus on the concepts of project risk management practices of ERA. The focus areas that the research tries to asses are the project risk management practices in ERA, asses the project risk are identification, analysis of risks done, monitoring and controlling system and practices, and identification of major risks and their impacts on ERA in its project objective.

Figure 2-2: Conceptual framework



Source: Own (2020)

CHAPTER THREE

METHODOLGY

3.1 Introduction

This chapter presents the methodology that is used in the study. The chapter specifically presents the research design, type and source of data, sample design, sampling techniques, data gathering instruments, population, method of data analysis and presentation, validity and reliability of the data and finally ethical consideration of the project work.

3.2 Research Design

According to Saunders, Lewis and Thornhill (2009) research design is the general plan of how the researcher will go about answering the research questions. It contains clear objectives, derived from the research question(s), specify the sources from which the researcher intends to collect data, and consider the constraints that will inevitably have as well as discussing ethical issues.

The study uses descriptive approach to describe the data concerned with project risk management practices in ERA. Since the study aims at assessing project risk management practices in ERA, the primary tasks of this study was aimed at gathering facts and relevant opinions.

Creswell (2009) stated that as there is more insight to be gained from the combination of both qualitative and quantitative research than either form by itself. Their combined use provides an expanded understanding of research problems. Thus, with the intention of getting the general picture of the practice of project risk management, the research adopt both quantitative and qualitative research approaches (mixed research approach) in conducting the study.

3.3 Type and Source of Data

The study uses both primary and secondary sources of data that helps on gathering relevant data to achieve the research objectives. The primary data is collected by using both open ended and close ended questions questionnaires through purposive sampling. The secondary data is

collected by reviewing contract documents, reports, registers, journals, articles and other risk related documents.

3.4 Sample Design

A target population is the collection of those people, events and records with the desired information for the research study from which a sample is taken (Saunders, Lewis & Thornhill,. 2009). Thus, in this study the targeted population is selected through non-probability sampling techniques from ERA.

3.5 Sampling Techniques

According to the limitation of time and the pandemic situation taking a large number of populations is not applicable. On the reason of that non-probability sampling techniques of purposive sampling is feasible to be chosen because it is easy, less cost, fast and less physical contact.

3.6 Sample Size

Samples focuses on population like project management teams, resident engineers, design engineers, procurement and contract management employees, and employees who have experience on risk management. From the total targeted population of 340 employees took 86 samples.

3.7 Data Gathering Instruments

In order to gather firsthand information, questionnaire was prepared and administered based on the review of related literature important to the subject of the study. This study employed review of risk management documents and questionnaires from ERA staffs is used as a tool to collect data. The reviewed project documents and literatures were used as an input knowledge to develop an insight on project risk management practices. The questionnaires were designed to focus on the practice of project risk management in ERA. The questionnaire was adopted from Tesfamichael (2018) Addis Ababa University MA thesis questionnaire and Aminu (2018) Addis Ababa university MA thesis questionnaire.

3.8 Method of Data Analysis

The data collected is analyzed using both quantitative and qualitative methods. The data obtained using close ended questionnaires analyzed by descriptive statistics using Statistical Package for Social Science (SPSS) software version 26. The data obtained using open ended questionnaires analyzed by organizing common ideas of response in to manageable data.

For the major project risks and risk impact RII method is used to analyze the data and based on the RII result the impact of the risks are ranked. Kometa, *et al.* (1994) and Sambasivan, and Soon, (2007) used the RII method to determine the relative importance of the various causes of impacts. The same method was adopted in this study. The five-point Likert scale ranged from 1 (very low important) to 5 (very high important) was adopted and transformed to RII for each risks as follows:

$$RII = \frac{\sum W}{A * N}$$

Where:

W - The weighting given to each factor by the respondents (ranging from 1 to 5),

A - The highest weight (i.e. 5 in this case),

N - The total number of respondents. The RII value had a range from 0 to 1 (0 not inclusive), higher the value of RII, more important was the cause of delays.

RII was computed for each risk to identify the most and the least significant quality, cost and time impacts in ERA projects. According to the computed RII values, these factors were ranked. Respondent's scorings (from 1=very low important to 5=very high important), computed RII's, and ranks.

3.9 Content Validity & Reliability

According to Creswell, (2009), employing multiple data collection instruments help the researcher to combine strengthen and amend some of the inadequacies and for triangulation of the data. Accordingly, in this research work the data obtained from primary & secondary data is

used and analyzed to increase the triangulation of the data process implemented and results analyzed and conclusion is derived from it.

The reliability of the questionnaire was checked by the Cronbach's-Alpha test coefficient using SPSS version 26.0 software and the result obtained was 0.791.

Table 3-1: Cronbach's alpha test coefficient values

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.791	.793	66

Source: Own survey (2020) SPSS version 26.0

3.10 Ethical Consideration

In this research work preparation, the ethical confidential documentation is implemented & taken in to account during the overall process. All the documents used during the preparation of this research are used for the accomplishment of this paper. Moreover, there is no personal interest and the researcher acts professionally.

CHAPTER FOUR

DATA PRESENTAION AND ANALYSIS

4.1 Introduction

This chapter presents the result of the analysis of the data obtained from the respondents. The results are presented by using descriptive statistics. To analyze the collected data with that of the objective set for this research, Statistical procedures were carried out using SPSS Statistics version 26. In order to assess the practice of risk management and make workable recommendations for the raised gaps concerning ERA project risk management practice, the researcher has collected data through close and open ended questionnaire, and documents.

4.2 Response rate

The primary data that was collected through questionnaire consisted of 29 close-ended and open-ended items and was distributed to 86 individuals who are experienced on risk management in ERA. In the closed-ended questions, the respondents were required to choose their choices from the provided alternatives: the practice questions used Likert scale with Strongly Disagree (SD) = 1, Disagree (D) = 2, Uncertain (U) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5. Among the sample size of 86 sample size, 82 questionnaires that has 95.34% response rate were properly completed and returned. The collected data was analyzed, interpreted and presented in the below tables and figures.

4.3 Demographic Characteristics of the study participants

This section of the questionnaire covered the respondent's age, sex, educational background, duration of work experience.

4.3.1 Age

Table 4-1: Respondents Age

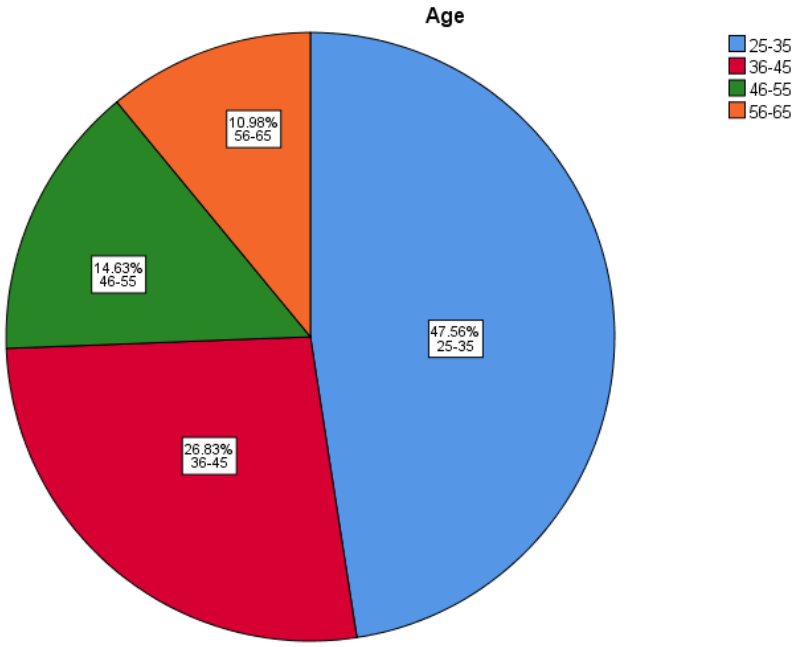
Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-35	39	45.3	47.6	47.6
	36-45	22	25.6	26.8	74.4

	46-55	12	14.0	14.6	89.0
	56-65	9	10.5	11.0	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020)

As seen in Table 3, 47.6% (39) of the respondents were in the age range of 25-35, 26.8% (22) respondents were in the age range of 36-45, 14.6% (12) were in the range of 46-55, and 11% (9) respondents were in the age range of 56-65. As per to the responded data analyzed majority of the respondents were in the age of 25-35. Because of the different age class of the respondents the research gathers the required data from various points of view in terms of age gap

Figure 4-1: Respondents Age



Source: Own survey (2020)

4.3.2 Gender

Table 4-2: Respondents Gender

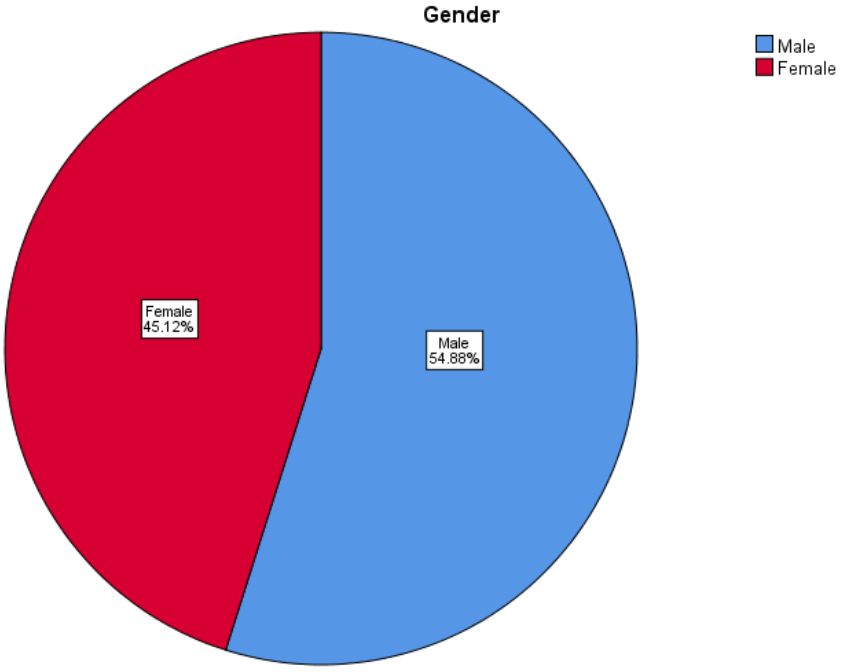
		Frequency	Percent	Valid Percent
Valid	Male	45	52.3	54.9
	Female	37	43.0	45.1

	Total	82	95.3	100.0
Missing	System	4	4.7	0
Total		86	100.0	

Source: Own survey (2020)

As presented in table 4, male of 54.9% (45) and female 45.1% (37) totally 82 respondents participated in the research. This indicated that majority of the respondents were males and the diversity of the gender.

Figure 4-2: Respondents Gender



Source: Own Survey (2020)

4.3.3 Educational Background

Table 4-3: Respondents Level of Education

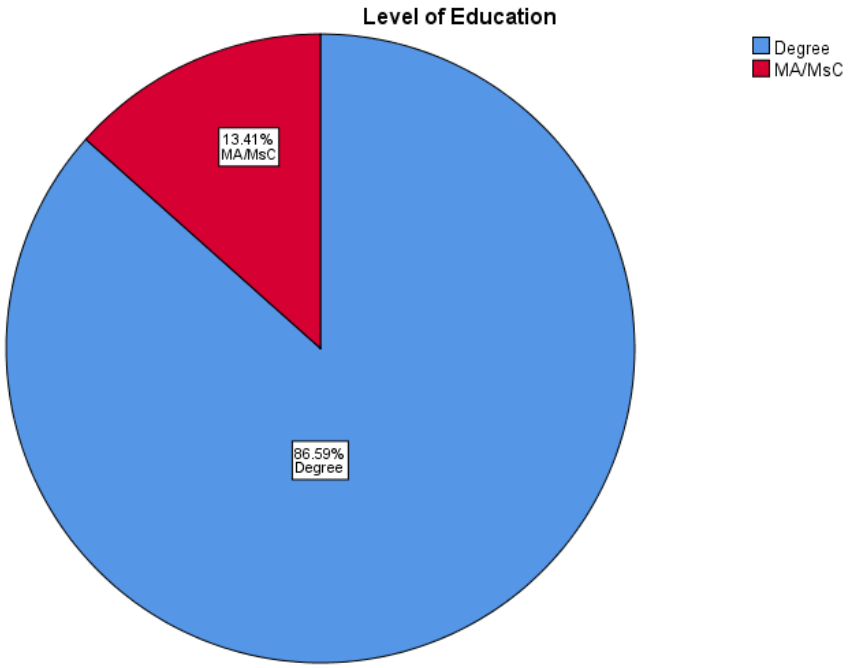
Level of Education					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Degree	71	82.6	86.6	86.6
	MA/M.Sc.	11	12.8	13.4	100.0
	Total	82	95.3	100.0	

Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

Looking into the respondents educational background; among the total respondents 86.6% (71) are Degree holders and the rest 13.4% (11) respondents have postgraduate degree. As per the analysis the result indicates that all the respondents are professionals on the basis of education this is a very good opportunity to identify and manage risks.

Figure 4-3: Respondents Level of Education



Source: Own survey (2020)

4.3.4 Experience

Table 4-4: Respondents Work Experience

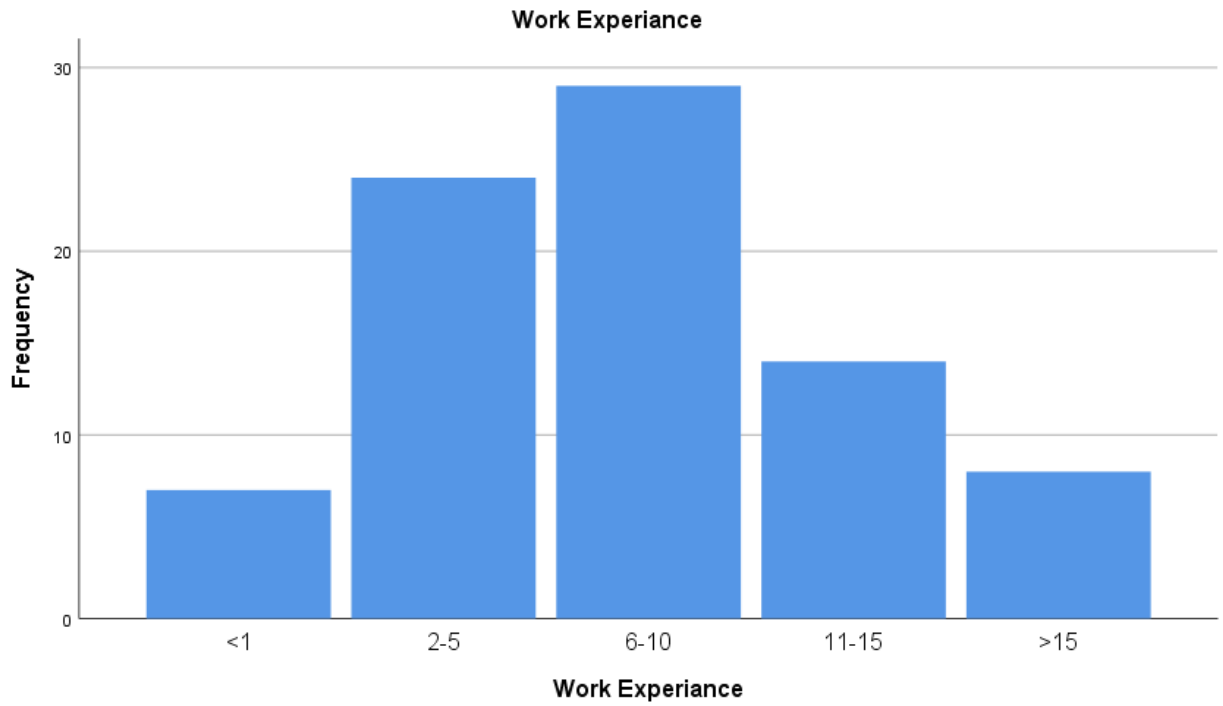
Work Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1	7	8.1	8.5	8.5
	2-5	24	27.9	29.3	37.8
	6-10	29	33.7	35.4	73.2

	11-15	14	16.3	17.1	90.2
	>15	8	9.3	9.8	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

As per to the survey the work experience out of eighty two respondents 35.4% (29) of them have 6-10 year of experience, 29.3% (24) have 2-5 year of experience, 17.1% (14) of respondents have experience of 11-15 years, 9.8% (8) of the respondents have experience above fifteen years and 8.5% (7) of the respondents have an experience for less than one year. The respondents are found in different level of work experience this aided to gather sufficient data.

Figure 4-4: Respondents Work Experience



Source: Own survey (2020)

4.4 ERA Project Risk Management Practices

Table 4-5: General project risk management practices

Nº	General project risk management practice question	Responses in percent (%) (n)				
		SA	A	N	D	SD
1	ERA have a practice of risk management techniques	25.6 (21)	39 (32)	3.7 (3)	23.2 (19)	18.1 (7)
2	There is policy or guideline/manual in ERA to manage risk	52.4 (43)	43.9 (36)	3.7 (3)	0	0
3	There is risk management department which is responsible for project risk management in ERA	0	0	7.3 (6)	32.9 (27)	59.8 (49)
4	There is risk management officer/team in ERA	0	0	8.5 (7)	56.1 (46)	35.4 (29)
5	Risk management is undertaken continuously throughout the project work	3.7 (3)	15.9 (13)	1.2 (1)	52.4 (43)	26.8 (22)
6	ERA and its projects have a risk register	22 (18)	67.1 (55)	11 (9)	0	0
7	ERA allocates enough resources for the risk management practices	22 (18)	59.8 (49)	3.7 (3)	14.6 (12)	0
8	There is an appropriate documentation system in projects	17.1 (14)	51.2 (42)	13.4 (11)	18.3 (15)	0

Source: own survey (2020) Note: Numbers in () are frequency counts

Table 4-6: Response on policies/manual

There is policy or guideline/manual in ERA to manage risk					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	43	50.0	52.4	52.4
	Agree	36	41.9	43.9	96.3
	Neutral	3	3.5	3.7	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

As shown in Table 8 out of the total eighty two respondents, 52.4% (43) of the respondents strongly agree on the existence of policy or manual, 43.9% (36) of respondents agree on the existence of policy or guideline to manage risk however 3.7% (3) of respondents were neutral on the existence of policy or manual. From this finding ERA have a policy or guideline/manual to manage risks on its project works.

Table 4-7: Response on Responsible department

There is risk management department which is responsible for project risk management in ERA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	6	7.0	7.3	7.3
	Disagree	27	31.4	32.9	40.2
	Strongly Disagree	49	57.0	59.8	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

The data in Table 9 indicates that 59.8% (49) of the total respondents strongly disagree on the existence of responsible department in ERA, 32.9% (27) respondents were disagree on the existence of responsible department to manage risk in ERA, while the rest 7.3% (6) respondents were neutral. From the analysis the interpretation was that the absence of responsible risk

management department creates a gap on managing risk in ERA. However according to open ended question the risk management in the authority are mostly handled by the consultants.

Table 4-8: Response on consistency of risk management

Risk management is undertaken continuously throughout the project work					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	3	3.5	3.7	3.7
	Agree	13	15.1	15.9	19.5
	Neutral	1	1.2	1.2	20.7
	Disagree	43	50.0	52.4	73.2
	Strongly Disagree	22	25.6	26.8	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

The data in Table 10 indicated that 52.4% (43) of the respondents disagree to the question, 26.8% (22) of the respondents replied strongly disagree, 15.9% (13) respondents replied agree, 3.7% (3) of the respondents strongly agree while the remaining 1.2% (1) respondent being neutral. As per to the analysis risk is not undertaken continuously as a process throughout the project work. This makes a gap on avoiding or minimizing of risks or uncertainties proactively.

Table 4-9: Response of risk register

ERA and its projects have a risk register					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	18	20.9	22.0	22.0
	Agree	55	64.0	67.1	89.0
	Neutral	9	10.5	11.0	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

The data in Table 11 showed out of eighty two respondents 67.1% (55) of them have agreed that ERA and its projects have a risk register, 22% (18) of the respondents have expressed their strongly agreement that ERA and its projects have a risk register while the rest 11% (9) respondents remained neutral for the question raised. Based on this result it is possible to conclude that ERA has a risk register for its projects; having of a risk register is used to identify potential risks in project objective, to analyze how likely they are to occur, take action to prevent the risks that can be avoid and minimize that can't be avoid or minimize.

Table 4-10: Risk management practice descriptive statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ERA have a practice of risk management techniques	82	1	5	2.50	1.326
There is policy or guideline/manual in ERA to manage risk	82	1	3	1.51	.572
There is risk management department which is responsible for project risk management in ERA	82	3	5	4.52	.633
There is risk management officer/team in ERA	82	3	5	4.27	.610
Risk management is undertaken continuously throughout the project work	82	1	5	3.83	1.109
ERA and its projects have a risk register	82	1	3	1.89	.567
ERA allocates enough resources for the risk management practices	82	1	4	2.11	.916
There is an appropriate documentation system in projects	82	1	4	2.33	.969
Valid N (list wise)	82				

Source: own survey (2020)

As shown in the table the average response collected from the questionnaire about project risk management practice in ERA was mostly below the average and this indicates the lack of risk management practice in ERA. The standard deviation was positive and lesser than the mean and it was well in statistical analysis.

4.5 Risk Identification

Table 4-11: Descriptive statistics of risk identification

Statistics				
		All the teams play roles on identifying risks	What risk identification methods are used for the projects in ERA?	Sources of risks usually encounters in projects
N	Valid	82	82	82
	Missing	4	4	4
Mean		3.62	3.16	1.80
Median		4.00	4.00	2.00
Std. Deviation		1.002	1.621	.909
Variance		1.003	2.629	.826
Percentiles	25	4.00	1.75	1.00
	50	4.00	4.00	2.00
	75	4.00	4.00	3.00

Source: own survey (2020)

As indicated on Table 13 the average mean gotten from the raised question about risk identification was below the average and this shows risk identification practice in ERA was lesser. The standard deviation was positive and lesser than the mean and it was well in statistical analysis.

Table 4-12: Role on risk identification

All the teams play roles on identifying risks					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	8.1	8.5	8.5
	Agree	5	5.8	6.1	14.6
	Neutral	5	5.8	6.1	20.7
	Disagree	60	69.8	73.2	93.9
	Strongly Disagree	5	5.8	6.1	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

The data shown in Table 14 confirmed that 73.2% (60) of the respondents disagree that the teams did not play any role on identifying risks, 8.5% (7) of the respondents strongly agree that the teams are play a role on identifying risks, 6.1% (5) of the respondents strongly disagree on the role of the team on identifying risk, 6.1% (5) of the respondents agree and the other 6.1% (5) of the respondents were neutral for the question raised. From the result, one can deduce that majority of the respondents answered that the teams did not play a role on identifying risks.

Table 4-13: Methods used for risk identification

What risk identification methods are used for the projects in ERA?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Document Review	20	23.3	24.4	24.4
	Information Gathering	13	15.1	15.9	40.2
	SWOT Analysis	6	7.0	7.3	47.6
	Expert Judgment	25	29.1	30.5	78.0
	Checklist Analysis	13	15.1	15.9	93.9
	Other please specify	5	5.8	6.1	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020)

The data shown in Table 15 confirmed that from the total number of eighty two respondents 30.5% (25) were replied expert judgment method that is used to identify risk on projects, 24.4% (20) respondents replies document review as a method used, 15.9% (13) of respondents says information gathering are used as mechanism to identify risk, 15.9% (13) respondents replied checklist method were used to identify risk in ERA, 7.3% (6) respondents answered SWOT analysis were the method used for identifying risk, from the rest 6.1% (5) of the respondents most of them mentioned assumption analysis as method used for identifying risk. As per to the analysis most of the respondents expert judgment were used as a mechanism to identify risks on projects and document review was the other most used technique on identifying risk, next to that the respondents believed that information gathering and checklist analysis are the third methods employed as a method to identify risk.

Table 4-14: Sources of risks

		Frequency	Percent	Valid Percent
Valid	Financial	40	46.5	48.8
	Technical	21	24.4	25.6
	Environmental	18	20.9	22.0
	Other please specify	3	3.5	3.7
	Total	82	95.3	100.0
Missing	System	4	4.7	0
Total		86	100.0	

Source: Own survey (2020)

Respondents were asked to identify the different sources of risks that usually encounters in projects managed by ERA. Accordingly, the data in Table 16 showed that about 48.8% (40) of the respondents identified financial sources, 25.6% (21) of respondents technical problems as sources of risks, 22% (18) respondents identified environmental problems as sources for risk that usually encounters in projects in ERA, and the remaining 3.7% (3) of the respondents mentioned that human issues are the other source of risk. From the conclusion of the analysis result financial factors were reflected as a major source of risk that usually encounters in ERA projects next to financial factor technical factors and environmental factors takes place respectively as a source of risk.

4.6 Risk Analysis

Table 4-15: Descriptive statistics for risk analysis

Statistics

		Characteristics of risk are considered before analyzing the identified risk	There is a measurement to analyze	Project documents are updated after assessment of the risk that might occur	What risk analysis methods are used for the projects in ERA
N	Valid	82	82	82	82
	Missing	4	4	4	4
Mean		2.45	1.84	1.84	3.06
Median		2.00	2.00	2.00	2.00
Std. Deviation		.877	.618	.808	1.628
Percentiles	25	2.00	1.00	1.00	2.00

	50	2.00	2.00	2.00	2.00
	75	3.00	2.00	2.00	5.00

Source: Own survey (2020)

As shown in the Table 17 the average response collected from the questionnaire about risk analysis in ERA was above the average and this indicates the risk analysis is undertaken in ERA. The standard deviation was positive and lesser than the mean and it was well in statistical analysis.

Table 4-16: Characteristics of risk considered before risk analysis

Characteristics of risk are considered before analyzing the identified risk					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	8.1	8.5	8.5
	Agree	45	52.3	54.9	63.4
	Neutral	16	18.6	19.5	82.9
	Disagree	14	16.3	17.1	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020)

The data in Table 18 depicted that 54.9% (45) and 8.5% (7) of the respondents agree and strongly agree respectively that characteristics of risk are considered before analyzing the identified risk. But 19.5% (16) of the respondents were neutral. The remaining 17.1% (14) respondents have expressed their disagreement that the characteristics of risk are considered before analyzing the identified risk. The response result implies that characteristics of risk are considered before analyzing the identified risk.

Table 4-17: Measurement to analyze

There is a measurement to analyze					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	23	26.7	28.0	28.0
	Agree	49	57.0	59.8	87.8
	Neutral	10	11.6	12.2	100.0

	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020) SPSS Version 26.0

As shown in Table 19, about 59% (49) of respondents have agreed that there is a measurement system, within the project to analyze risk. Likewise, about, 28% (23) of the respondents have strongly agreed that there is a measurement system within the project to analyze risk. The remaining 12.2% (10) of the respondents remained neutral unable to decide that there was a measurement system within the project to analyze risk. This result indicates majority of the respondents were agreed and strongly agreed that there was a way to measure risk that might occur within the projects.

Table 4-18: Response on risk analysis methods

What risk analysis methods are used for the projects in ERA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Quantitative risk analysis	8	9.3	9.8	9.8
	Expert judgment	40	46.5	48.8	58.5
	Sensitivity analysis	2	2.3	2.4	61.0
	Probability and impact matrix	11	12.8	13.4	74.4
	Risk categorization	17	19.8	20.7	95.1
	Risk Urgency assessment	4	4.7	4.9	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020)

As illustrated in the Table 20, 48.8% (40) of respondents replied expert judgment was undertaken to analyze risk, 20.7% (17) respondents answered as risk categorization, 13.4% (11), 9.8% (8), 4.9% (4) and 2.4% (2) of the respondents replied that probability and impact matrix, quantitative risk analysis, risk urgency assessment and sensitivity analysis were undertaken as risk analysis method on projects. From the result it was concluded expert judgment, risk categorization and probability and impact matrix as major methods used in ERA to analyze risk.

4.7 Risk Monitoring and Control

Table 4-19: Descriptive statistics of risk monitoring and control

Statistics								
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 6
N	Valid	82	82	82	82	82	82	82
	Missing	4	4	4	4	4	4	4
Mean		3.52	3.62	3.60	3.80	3.56	4.17	4.11
Median		4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mode		4	4	4	4	4	4	4
S.D		.906	1.085	.829	.823	.650	.540	.648
Variance		.820	1.176	.688	.678	.422	.291	.420
Percentiles	25	3.00	3.00	3.00	3.00	3.00	4.00	4.00
	50	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	75	4.00	4.00	4.00	4.00	4.00	4.25	5.00

Source: Own survey (2020)

As indicated in the table 21 the average response collected from the questionnaire about risk monitor and control practice in ERA was below the average and this indicates the absence of risk monitoring and controlling practice in ERA. The standard deviation was positive and lesser than the mean and it was well in statistical analysis.

Table 4-20: Responses on risk registration and communication

Risks are registered and communicated properly					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	13	15.1	15.9	15.9
	Neutral	23	26.7	28.0	43.9
	Disagree	36	41.9	43.9	87.8
	Strongly Disagree	10	11.6	12.2	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: own survey (2020)

As demonstrated in Table 43.9% (36) and 12.2% (10) of the respondents disagree and strongly disagree on risk registered and communicated properly on projects, 28% (23) of respondents

being neutral for the issue whether risks were registered and communicated properly, 15.9% (13) of respondents agree that risk are registered and communicated properly. According to the analysis it can be concluded that ERA was not register and communicate risks properly.

Table 4-21: Responses of risk review

Risks are reviewed periodically					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	19	22.1	23.2	23.2
	Neutral	12	14.0	14.6	37.8
	Disagree	32	37.2	39.0	76.8
	Strongly Disagree	19	22.1	23.2	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7	0	
Total		86	100.0		

Source: Own survey (2020)

As indicated in Table 23 out of the total of the eighty two respondents 39% (32) and 23.2% (19) of the respondents disagree and strongly disagree respectively that risk were reviewed periodically, 23.2% (19) of total respondents agree on the risk were reviewed periodically and 14.6% (12) respondents were neutral of the risk were periodically reviewed. According to the analysis it can be concluded risks were not reviewed periodically in ERA.

Table 4-22: Response on risk monitor and control

Risks are monitored and controlled appropriately					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	7	8.1	8.5	8.5
	Neutral	16	18.6	19.5	28.0
	Disagree	45	52.3	54.9	82.9
	Strongly Disagree	14	16.3	17.1	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

Source: Own survey (2020)

As per the data in Table 24 respondents were requested to reflect their perception regarding to risks were monitored and controlled appropriately; the responses show 54.9% (45) and 17.1% (14) disagree and strongly respectively, 19.5% (16) of the respondents were neutral for this issues while 8.5% (7) respondents were agreed that risks are monitored and controlled appropriately. This result implies the majorities of respondents were disagreed and strongly disagreed with the proper monitoring and controlling of risks in ERA.

4.8 Major Risks in ERA Projects

In this section the data collected from the questionnaire that deals with on identifying the major types of risks involved in ERA, their probability of occurrence, and impact of different types of risks on project quality, cost and time will be analyzed and interpreted.

4.8.1 Identifying Major Risks and Their Probability of Occurrence

Table 4-23: Response on probability of occurrence

N^{o}	Risk type	Frequency of probability of occurrence				
		Very Low	Low	Medium	High	Very High
1	Technical	1	6	60	0	15
2	Construction	0	0	7	65	10
3	Physical	57	23	2	0	0
4	Organizational	42	40	0	0	0
5	Financial	0	0	20	38	24
6	Socio political	2	41	39	0	0
7	Environmental	1	40	40	0	1
8	Design	0	0	12	58	12
9	Legal	30	43	9	0	0
10	Material	0	0	43	39	0
11	Right to way	0	0	50	32	0

Source: Own survey (2020)

As shown in Table 25 the frequency of weights is given to indicate the probability of occurrence for different types of risks on construction project by eighty two respondents. From the risk types in construction projects financial risks replied very high (24) and (38) high probability of occurrence, (12) respondents choose very high and (58) respondents reacts high for design risk. On third position the respondents (65) replied high construction. Respondents replied list for physical, organizational and legal risks. The analysis indicates the respondents take financial, design and construction risks as a very high and high probability of occurrence.

Table 4-24: RII and Rank of project risks based on their probability of occurrence

N^{o}	Types of Risk	RII value on Probability of Occurrence	Rank
1	Technical	0.717	4th
2	Construction	0.729	3rd
3	Physical	0.266	11th
4	Organizational	0.298	10th
5	Financial	0.837	1st
6	Socio political	0.490	8th
7	Environmental	0.502	7th
8	Design	0.8	2nd
9	Legal	0.349	9th
10	Material	0.695	5th
11	Right to way	0.678	6th

Source: Own survey (2020)

By using the RII formula the respondent's response on the probability of occurrence is calculated and ranked. As shown on the above table financial risks ranked first with (0.837) RII based on its

probability of occurrence, design (0.8) RII ranked in the second place, construction risk ranked on third place with (0.729) RII result and technical, material and right to way risks were ranked four up to six place respectively with a 0.717, 0.695 and 0.679 RII results. From the ranking of risks in ERA projects financial, design and construction risks are identified as the three major important risks in the authority while legal, physical and organizational risks are relatively lower important risks in ERA.

4.8.2 Impacts of Risks on Project Quality

Table 4-25: Responses on the impact of risks on project quality

N^{o}	Risk type	Frequency of Impact on Project Quality				
		Very Low	Low	Medium	High	Very High
1	Technical	0	0	28	54	0
2	Construction	0	19	3	60	0
3	Physical	0	28	29	25	0
4	Organizational	0	41	22	19	0
5	Financial	0	0	4	78	0
6	Socio political	0	26	31	25	0
7	Environmental	0	15	45	22	0
8	Design	0	0	24	58	0
9	Legal	0	46	34	2	0
10	Material	0	0	5	77	0
11	Right to way	0	56	26	0	0

Source: Own survey (2020)

As per to the finding the impact of different risks on project quality by the sample respondents financial and material risks were the major risk types chosen with a high impact on project quality with 78 and 77 times respectively. And also construction, design and technical risks assigned with high impact with 60, 58 and 54 times respectively. Right to way, legal risk, socio

political risk and physical risks scores less. As it shown in the result financial and material risks are the top that have a high impact on project quality. Moreover construction, design and technical risks are high impact on project quality. While, right to way, legal, socio political and physical risks have a relatively low impact on project quality.

Table 4-26: RII value on impact on project quality

N^{o}	Types of Risk	RII value on Impact on Project Quality	Rank
1	Technical	0.731	4th
2	Construction	0.7	5th
3	Physical	0.592	8th
4	Organizational	0.546	9th
5	Financial	0.790	1st
6	Socio political	0.597	7th
7	Environmental	0.617	6th
8	Design	0.741	3rd
9	Legal	0.492	10th
10	Material	0.787	2nd
11	Right to way	0.463	11th

Source: Own survey (2020) SPSS Version 26.0

On the basis of the RII value financial risk (0,790) ranked first on its impact on project quality, in second place material risk (0.787) ranked and design risk (0.741) ranked on third place on their impact on project quality. Organizational, legal and right to way risks takes place the last ranks 9, 10 and 11 respectively. This result implies that financial, material and design risks have a high

impact on project quality on ERA projects while organizational, legal and right to way risk types have a low impact on project quality on ERA projects.

4.8.3 Impacts of Risks on Project Cost

Table 4-27: Responses on the impact of risks on project cost

Nº	Risk type	Frequency of Impact on Project Cost				
		Very Low	Low	Medium	High	Very High
1	Technical	0	0	28	54	0
2	Construction	0	0	11	71	0
3	Physical	0	0	57	25	0
4	Organizational	0	41	25	16	0
5	Financial	0	0	4	78	0
6	Socio political	0	0	22	60	0
7	Environmental	0	6	64	12	0
8	Design	0	0	12	70	0
9	Legal	20	6	8	48	0
10	Material	0	5	44	33	0
11	Right to way	0	0	49	33	0

Source: Own survey (2020)

As per to the findings the impact of different risks on project cost by the eighty two respondents financial, construction, and design risks were the major risk types chosen with a high impact on project cost with 78, 71, and 70 times respectively. And also socio political, technical and legal risks assigned with high impact with 60, 54 and 48 times respectively. An organizational and environmental risk scores less. As it shown in the result financial, construction and design risks are the major that have a high impact on project cost. Moreover socio political, technical and legal risks are also had a relative high impact on project cost. While, organizational and environmental risks have a relatively low impact on project cost.

Table 4-28: RII value on impact on project cost

N^{o}	Types of Risk	RII value on Impact on Project Cost	Rank
1	Technical	0.731	5th
2	Construction	0.773	2nd
3	Physical	0.660	8th
4	Organizational	0.539	11th
5	Financial	0.790	1st
6	Socio political	0.746	4th
7	Environmental	0.614	9th
8	Design	0.770	3rd
9	Legal	0.735	10th
10	Material	0.668	7th
11	Right to way	0.680	6th

Source: Own survey (2020)

On the basis of the RII value financial risk (0,790) ranked first on their impact on project cost, on second place construction risk (0.773) ranked and design risk (0.770) ranked on third place on their impact on project cost based on the RII value. Environmental, legal and Organizational, risks take place the last ranks 9, 10 and 11 respectively. This result implies that financial, construction and design risks have a high impact on project cost on ERA projects while environmental, legal and organizational risk types have a low impact on project quality on ERA projects.

4.8.4 Impacts of Risks on Project Time

Table 4-29: Responses on the impact of risks on project time

N^{o}	Risk type	Frequency of Impact on Project Time				
		Very Low	Low	Medium	High	Very High
1	Technical	0	0	26	56	0
2	Construction	0	0	24	58	0
3	Physical	0	34	47	1	0
4	Organizational	0	9	22	51	0
5	Financial	0	0	12	70	0
6	Socio political	0	12	21	49	0
7	Environmental	0	24	0	58	0
8	Design	0	10	35	37	0
9	Legal	0	2	35	45	0
10	Material	0	2	20	60	0
11	Right to way	1	2	25	54	0

Source: Own survey (2020)

As per to the distributed questionnaire the impact of different risks on project time by the eighty two respondents financial risks were the major risk type assigned with a high impact on project time 70 times. Additionally material, environmental, construction, technical, right to way risks assigned as a high impact 60, 58, 58, 56 and 54 times respectively while design and Physical risk scores less impact on time. As per to the analysis financial is the major risk that has a high impact on project time. Moreover material, environmental, construction, technical and right to way risks are also had a relative high impact on project cost. While, physical risk has a relatively low impact on project time.

Table 4-30: RII value on impact on project time

Nº	Types of Risk	RII value on Impact on Project time	Rank
1	Technical	0.736	3rd
2	Construction	0.741	2nd
3	Physical	0.519	10th
4	Organizational	0.702	6th
5	Financial	0.770	1st
6	Socio political	0.690	7th
7	Environmental	0.682	8th
8	Design	0.665	9nd
9	Legal	0.704	5th
10	Material	0.741	2nd
11	Right to way	0.721	4th

Source: Own survey (2020)

On the basis of the RII value financial risk (0,770) ranked first on their impact on project time, on second place material and construction risks (0.741) ranked and technical risk (0.736) ranked on third place on their impact on project time. Design and technical risks takes place the last ranks of 9 and 10 respectively. The result from the RII implies that financial, material and construction risks have a high impact on project time on ERA projects while design and physical risk types have a low impact on project time on ERA projects.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The research comes with a final objective clearly stated in section 1.3 of the introduction part, as to assess the practices of project risk management practices. In light of this, the project work assessed how risk are identified, analyzed, monitor and controlled, identify the major types of risks and rank the risks based on their probability of occurrence and impact on project quality, cost and time. To achieve these objectives, the study used literature review, project reports, open and closed ended questioner as a research instrument where descriptive analysis was made. The data obtained through questionnaire was analyzed quantitatively using SPSS 26 software.

Finally, the data collected from the respondents were analyzed; interpreted and major findings are summarized and presented in a way that, the objective of the study set out were addressed within the findings summarized as follows.

5.2 Summary of Key Findings and Conclusions

According to the data analyzed in pervious chapter the researcher comes up with the following results.

- As per to the respondents reply and document reviewed ERA has a policy or guideline/manual to manage risks in the project. However, there is no a risk management department as well as officer which is responsible for project risk management. Moreover risks are not managed continuously throughout the project works. The presence of policy or manual creates an opportunity for ERA to manage risk properly but on a reason of the absence of department and officer the manual is not practiced properly as well as risks is not managed continuously. On the other hand according to the result from the analysis ERA and its projects have a proper documentation and risk register to identify potential risks at the same time ERA allocates enough resources for the risk management practices to prevent risks and give response for the risks occurred but those resources are not used properly on the reason of unassigned responsible department for risk management.

- According to risk identification the result of the analysis indicates that in ERA on identifying risk all the teams didn't play a role that creates a gap on identifying risk easily at the scratch. As per the analysis mostly used risk identification methods are expert judgment, document review, information gathering and checklist analysis. Additionally source of risk encountered in ERA projects are financial sources and at some point technical sources are also encounters.
- Results of the analysis regarding to risk analysis indicate the characteristics of the identified risks are considered before it is analyzed additionally there is a measurement to analyze risk. Considering identified risks can direct how a risk should be analyzed and measured. As per the finding the mostly used risk analysis methods used in ERA is expert judgment, next to that risk categorization is the other method.
- Regarding to the analysis result risk monitoring and control risks that are occurred during the project work are not registered and communicated properly at the same time risks that are occurred during the project work didn't reviewed periodically. In a reason of this risks are not monitored and controlled properly in ERA projects and this impacts the project objectives.
- According to the analyzed data risks that have a high probability of occurrence in ERA projects are financial risk, design risks and construction risks. Those legal, physical and organizational risks have a lower probability of occurrence.
- As per to the analyzed data financial and material risks are the major risks that impact the project quality. On the other hand organizational, legal and right to way risks have less impact on project quality. Regarding to project cost financial, construction, design and socio political risks are the major types of risk that impacts project cost. In contrast organizational and environmental have less impact on project cost. The risk that impact the project time are mostly financial risks next to that material environmental, construction and technical are also the major risks that impact project time.

5.3 Recommendation

In this section recommendation was given by the researcher in order to fill the gap on project risk management practices in ERA projects.

- ERA needs to form risk management department/responsible body on its organization to manage a risk occurred on its projects and for the proper use of allocated resources for risk management. In this department various teams should be formed according to the tasks will be done.
- All the teams should participate on identifying risk because risks are always from different sources. The methods used on identifying risk should also practice such as assumption analysis and diagramming techniques. After the risks are identified it should be analyzed with different mechanisms like probability and impact matrix, .
- Monitoring and controlling risks throughout the process of the project must be done in order to measure the overall implementation of risk management process and evaluate performance. Additionally risks should also register, communicated and reviewed periodically.
- For financial, design, construction and material risks an attention should be given because as seen on the result from the study there impact on project quality, cost and time are high and also have high probability of occurrence.

REFERENCES

Akbiyikli, R. D. (2012). Insurance Issues and Design and Build Construction Contracts; Journal of New World Sciences Academy, 203-214

Baloi D., & Price A., 2003, Modeling global risk factors affecting construction cost performance, International Journal of Project Management 21, pp 261-269.

Bunni, N. G. (2003). Risk and Insurance in Construction; London and New York: Spon Press.

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

Cooper, D., Grey, S., Raymond, G., & Walker, P. (2005). *Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements* . Southern Gate, Chichester: John Wiley & Sons Ltd.

Ebrahimnejad, S., Mousavi, S., & Mojtahedi (2008). A Model for Risk Evaluation in Construction Projects Based on Fuzzy MADM. Iran

ERA (2018). Risk Management Manual. Addis Ababa; Ethiopia.

ERA (2019). ERA Structure. Addis Ababa; Ethiopia.

ERA (2019). Risk identification, Analysis and Management Mechanism Report.

ERA-SMEC, S. E. (2008). Claims and Disputes Resolution Manual; Addis Ababa: ERA.

Flanagan, R. and Norman, G. (1993). Risk Management and Construction. Great Britain

Flanagan R. & Norman G., 1993 Risk Management and Construction, 2nd Edition. Blackwell Science.

Gould, F.E, and Joyce, N.E, (2002) Construction project management Upper Saddle River

Hillson, D. (2001). Extending the Risk Process to Manage Opportunities. UK, London

Hillson, D., & Murray-Webster, R. (2005). *Understanding and Managing Risk attitude* . Gower Publishing Limited.

Hillson, D., and Murray-Webster, R. (2007a), "Understanding and Managing Risk Attitude", Gower Publishing.

International Marine Contractors Association (2006). Identifying and Assessing Risk in Construction Contracts. United Kingdom, London

International Organization for Standardization. (2009). Risk Management-Principles and Guidelines (1st ed.). Switzerland, Geneva

Jaafari A., 2001, Management of risks, uncertainties and opportunities on projects: time for a fundamental shift, International Journal of Project Management 19, pp 89-101.

Keoki. S, Sears GA and Clough RH. (2008). Construction project management – A practical guide to field construction management. (5th ed.), John Wiley & Sons

Krantikumar, M., Konnur & Amarsinh, B. (2016). Risk Management in Construction Industry. International Journal of Engineering Research Volume No.5, p:153-155, Government College of Engineering, India, Karad

Nerija, B. & Audrius, B (2012). Risk Management in Construction Projects. Lithuania, Vilnius Gediminas Technical University, Vilnius

Office of Project Management Process Improvement, 2003, Project Risk Management Handbook, 1st edition.

Okema J., 2001, Risk and uncertainty management of projects: challenges of construction industry, Department of Architecture, Makerere University.

PMI. (2000). *A Guide to the Project Management Body of Knowledge* (2000 Edition uppl.). Upper Darby, PA: Project Management Institute.

Project Management Institute (2000). A Guide to the Project Management Body of Knowledge. 2nd ed. Newton Square, United States of America: Project Management Institute Inc. 216.

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

Project Management Institute (2013). A guide to the Project Management Body of Knowledge. (5th ed.), Newtown Square, Pennsylvania, USA

Potts, K., 2008. Construction cost management, learning from case studies. Abingdon: Taylor Francis

Ratterman, D. B. (2003); Managing Risk: Insurance and Indemnity Clauses in Construction Contracts; North American Steel Construction Conference.

Renuka, S. M., Umarani, C., Kamal, S. (2004). "A Review on Critical Risk Factors in the Life Cycle of Construction Projects". Journal of Civil Engineering Research, Vol. 4(2A): pp. 31-36, DOI: 10.5923/c.jce.201401.07.

Smith. N.J., Merna, T. & Jobbling P. (2006). Managing Risk in Construction Projects. (2nd ed.), Oxford, Blackwell Publishing

U.S. Department of Transportation, (2006)

Winch, G., 2002. Managing construction projects, an information processing approach. Oxford: Blackwell Publishing.

Winch, G. (2010). *Managing Construction Projects* (Second edition uppl.). Wiley Blackwell

Wubishet J. Mengesha (2004); performances for Public Construction Projects in Developing Countries: Federal Roads and Educational Building Projects in Ethiopia, NTNU (Doctoral Dissertation), Norway.

Wubishet J. Mengesha (2006); Construction Process Management; EACE Bulletin; June (2007)

X.W Zou, P., Zhang , G., & Wang , J. (2007). Understanding the key risks in construction projects in China . *International Journal of Project Management* , 601-614.

Yoe C., 2000, Risk Analysis Frame Work for Cost Estimation, in association with Planning and Management Consultants for U.S. Army Corps of Engineers, Institute ofWater Resources.

Zou, P., Zhang, G. and Wang, J-Y., 2007. *Understanding the key risks in construction projects in China. International Journal of Project Management*. Vol. 25, pp. 601– 614

APPENDIX

Appendix 1

Questionnaire

St. Mary's University

School of Graduate Studies

Assessment of Project Risk Management Practices at ERA

Dear respondent,

My name is Yohannes Abera; I am Post Graduate student in Project Management at St. Mary's University. As part of my MA requirement, I am doing project work entitled: "Assessment of Project Risk Management Practices at ERA."

I kindly request you to participate in this research work by completing the attached questionnaire. In order to ensure that all information will remain confidential please do not include your name in the questionnaire. I also sincerely request you to respond to the questions as honestly as possible and return the completed questionnaires via my Email address.

Your willingness and cooperation in giving reliable information is well appreciated and the information you provide will be used for academic purpose and will be kept strictly confidential.

Knowing that your time is valuable please, take few minutes of your time to complete the questionnaire.

For your responses send me via yohannesabera2430@yahoo.com and for any questions contact me via joe60abera@gmail.com/+251-920-572250.

Thank you in advance for your co-operation.

With regards Yohannes Abera

N.B Please mark one of the alternative choices that would describe you best:

PART I – General Information:

1. Sex

Male Female

2. Age

25-35 36-45 46-55 56-65

3. Level of Education

Diploma Degree MA/MsC PhD

4. Year of Experience in ERA

<1 2-5 6-10 11-15 >15

PART II Risk management practices

1. ERA have a practice of risk management techniques

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. There is policy or guideline/manual in ERA to manage risk

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. There is risk management department is responsible for project risk management in ERA

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. If your answer for question number 3 is disagree or strongly disagree who is responsible?

---

5. There is risk management officer/team in ERA

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. Risk management is undertaken continuously throughout the project work

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. ERA and its projects have a risk register

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. ERA allocates enough resources for the risk management practices

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. There is an appropriate documentation system in projects

Strongly Agree Agree Neutral Disagree Strongly Disagree

PART III Risk identification

1. All the teams play roles on identifying risks

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. What risk identification methods are used for the projects in ERA?

Document review

Information gathering

SWOT analysis

Expert judgment

Checklist analysis

Other please specify

3. Sources of risks usually encounters in projects

Financial

Technical

Environmental

Other please specify

Part IV Risk Analysis

1. Characteristics of risk are considered before analyzing the identified risk

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. There is a measurement to analyze risk

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Project documents are updated after assessment of the risk that might occur

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. What risk analysis methods are used for the projects in ERA?

Quantitative risk analysis

Expert judgment

Sensitivity analysis

Probability and impact matrix

Risk categorization

Modeling

Risk urgency assessment

Other please specify

Part V Monitoring and Control

1. Risks are registered and communicated properly

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. Risks are reviewed periodically

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Project performance is evaluated against risk

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. Risks are monitored and controlled appropriately

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. The project monitor, control and review the process for risk management to ensure that it complies with standards and procedures

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. Information available on the project is used to supplement to control risk

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. Risks that occur within the project are controlled in a way that goes with the goal and objective of the project

Strongly Agree Agree Neutral Disagree Strongly Disagree

Part VI Major Risks undertaken in ERA

(1 indicates = 0% (no present), 2 indicates 1-10% (rare), 3 indicate 10%-50% (possible), 4 indicates 50%-90% (Likely), 5 indicates 90%-100% (Almost certain to certain).

1. What are the major sources of risks in ERA projects? Please identify from the list and rank their probability of occurrence

Probability of occurrence

1 2 3 4 5

a. Technical risk
b. Construction risk
c. Physical risk
d. Organizational risk
e. Financial risk
f. Socio political risk
g. Environmental risk
h. Design risk
i. legal risk
j. material risk
k. Right of way risk
l. Other please specify

From your experience please indicate the impact of risks on cost time and quality (1 indicates Very Low, 2 indicates Low, 3 indicates Medium, 4 indicates High and 5 indicates Very High)

	Impact of risk on project														
	Quality					Cost					Time				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
a. Technical risk															

b. Construction risk															
c. Physical risk															
d. Organizational risk															
e. Financial risk															
f. Socio political risk															
g. Environmental risk															
h. Design risk															
i. Legal risk															
j. Material risk															
k. Right of way risk															
l. Others please specify															

Appendix 2

SPSS Output

There is risk management officer/team in ERA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	7	8.1	8.5	8.5
	Disagree	46	53.5	56.1	64.6
	Strongly Disagree	29	33.7	35.4	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

ERA allocates enough resources for the risk management practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	18	20.9	22.0	22.0
	Agree	49	57.0	59.8	81.7
	Neutral	3	3.5	3.7	85.4
	Disagree	12	14.0	14.6	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

There is an appropriate documentation system in projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	16.3	17.1	17.1
	Agree	42	48.8	51.2	68.3
	Neutral	11	12.8	13.4	81.7
	Disagree	15	17.4	18.3	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

Project documents are updated after assessment of the risk that might occur

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	31	36.0	37.8	37.8
	Agree	36	41.9	43.9	81.7
	Neutral	12	14.0	14.6	96.3
	Disagree	3	3.5	3.7	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

Project performance is evaluated against risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	8	9.3	9.8	9.8
	Neutral	27	31.4	32.9	42.7
	Disagree	37	43.0	45.1	87.8
	Strongly Disagree	10	11.6	12.2	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

The project monitor, control and review the process for risk management to ensure that it complies with standards and procedures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	7	8.1	8.5	8.5
	Neutral	22	25.6	26.8	35.4
	Disagree	53	61.6	64.6	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

Information available on the project is used to supplement to control risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	6	7.0	7.3	7.3

	Disagree	56	65.1	68.3	75.6
	Strongly Disagree	20	23.3	24.4	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		

Risks that occur within the project are controlled in a way that goes with the goal and objective of the project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	13	15.1	15.9	15.9
	Disagree	47	54.7	57.3	73.2
	Strongly Disagree	22	25.6	26.8	100.0
	Total	82	95.3	100.0	
Missing	System	4	4.7		
Total		86	100.0		