ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

ASSESSING THE PRACTICES OF CONSTRUCTION PROJECT RISK MANAGEMENT: CASE STUDY OF GRAND ETHIOPIA RENAISSANCE DAM

A THESIS TO BE SUBMITTED TO THE DEPARTMENT OF PROJECT MANAGEMENT AS A PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS (MA) DEGREE IN PROJECT MANAGEMENT

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Declaration

I, the under signed, declare that this thesis is my original work and has not been presented for a degree in any other University, and that all sources of materials used for the thesis have been duly acknowledged.

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Date_____

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Acronyms

BCM	Billion Meter Cube
GERD	Grand Ethiopia Renaissance Dam
EEP	Ethiopian Electric Power
EMV	Expected Monetary Value
EPC	Engineering, Procurement and Construction
ETB	Ethiopian Birr
IR	Identify Risk
KWH	Kilo Watt Hour
MW	Mega Watt
PMBOK	Project Management Body of Knowledge
PMO	Project Management Office
PMI	Project Management Institute
PRM	Plan Risk Management
RA	Risk Analysis
RMC	Risk Monitoring and Controlling
RR	Risk Responding
SPSS	Statistical Package for Social Sciences
WBS	Work Breakdown Structure
RBS	Risk Breakdown Structure
RMP	Risk Management Plan
SWOT	Strength Weakness Opportunity Threat

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Abstract

Risk as a threat that can affect success of projects if not addressed well. Risk management is a key part of project management for any project size. Although there is high importance of risk management to the success of construction projects, the adoption of these risk management methods in practice is in consistent. The main objective of the study was to describe the practice of project risk management practices in GERD Project. The scope of the study was limited to the extent of assessing, evaluating, analyzing, describing and identifying project risk management practices in GERD Project. The research was bounded by time and categorized under cross-sectional type. The design was descriptive, the sampling technique was purposive. Data had been collected through semi structured interview; closed ended questionnaire and document analysis. The respondents were comprised of project manager, project team, and experts of project management office. The quantitative data was analyzed statistically using Statistical Package for Social Sciences and the qualitative data was analyzed by relating the results with literatures. In addition, reliability and validity have also been taken into consideration. The main findings revealed that risk identification, qualitative risk analysis, monitoring and control were goodly practiced. While, the practice of quantitative risk analysis and risk response was fair.Whereas, the practice of risk planning was poor. As a recommendation, it is better the GERD construction looking into best practices to apply standard project risk management processes, tools and techniques in future projects in order to achieve projects' objective successfully.

Key words**:** *Risk, Risk Management, GERD construction, Project Risk Management*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Risks are considered as the probability of an unfavorable outcome arising from a decision (Wood and Ernest, 1977). In the construction management domain, Perry and Hayes (1985) define risk as an exposure to economic loss or gain arising from involvement in the construction process.

A project is said to be successful when the objectives of that project are met within allocated time period, budgeted cost, and within required specifications. One of the most single important things someone can do to ensure a successful project is managing risks. A risk is anything that could adversely affect project schedule, cost, quality or scope. That is a risk may impact project performance, cost, time and scope targets (Lewis, 2011).

Risks are unavoidable in almost every construction project whether if it is building projects, civil works, or any other type of construction projects. Risk is inherent in all human endeavors, including construction activities, and the risk factors involved are diverse and varied. Managing construction project risks is considered as compulsory for any project to be successful. Thus, this paper is aiming at providing comprehensive discussion on concepts of managing risks in construction projects.

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 (RM) for this study purpose is the one given 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 objectives 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 RM procedure will support better decision-making concerning risk, as 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.

Since the process of taking a project from initiation to completion and bringing it into operation a complex process, the construction industry is subject to more risk and uncertainty than many other industries (Flanagan and Norman, 1993).

1.2 Background of the Organization

The Blue Nile River has its source in the Ethiopian Highlands in the Lake Tana catchment. These highlands are considered as the water tower of East Africa providing Ethiopia with an estimated hydropower potential of 45,000 MW, which is the second largest potential in Africa after the DR Congo. Yet, in 2001, only 3% of this potential had been developed, and only 13% of the Ethiopian households had access to electricity. Due to an electricity access program, established in 2005, the number of households in rural towns and villages connected to the grid increased to over 40% in 2011, but one year later, Ethiopia had 57 kWh per capita and year, still at a very low consumption level, where the global average is 7000 kWh per capita and year. To meet the growing electricity demand that increased with improved access and challenged the provision, Ethiopia's power corporation commissioned three large hydropower plants in 2010 with a capacity above 2000 MW .In the course of the Climate-Resilient Green Energy strategy, the Ethiopian Government is planning to expand its hydroelectric capacity further and to become a regional power hub , by implementing several hydropower projects and building power transmission and distribution lines to neighboring countries . A major step in this regard was the announcement in 2011 to construct the largest reservoir in Africa near the border to Sudan, the Grand Ethiopian Renaissance Dam (GERD).

The Ethiopian Government mainly finances the construction by urging citizens and private companies to buy bonds to support the project, where turbines and technical equipment are financed by Chinese banks. Like many large-scale projects, the GERD is subject to a number of concerns and criticism with regard to jeopardizing downstream water security and livelihoods which created tension particularly between Egypt and Ethiopia. An assessment of the likely impacts of a dam such as the GERD, which is not in operation mode yet, comes along with a number of uncertainties. It is for instance unknown how the reservoir will be managed during the period of filling, at what filling state the dam becomes finally operational, if the system will be operated to maximize the generation of hydroelectric power or if release rules to preserve

ecological targets downstream are considered, how the hydro-climatic boundary conditions will either challenge or facilitate the management during filling and regular operation and the amount of water lost via seepage and evaporation.

The Grand Ethiopian Renaissance Dam (GERD), formerly known as the Millennium Dam, is under construction in the Benishangul Gumuz region of Ethiopia, on the Blue Nile River, which is located about 40km east of Sudan. The project is owned by Ethiopian Electric Power (EEP).Construction of the Grand Renaissance Dam started in April 2011 after the ETB80bn ($4.7bn) engineering, procurement and construction (EPC) contract was awarded to Salini Costruttori.

1.3 Statement of the Problem

To be successful, a project organization should be committed to address risk management proactively and consistently throughout the project (PMI, 2013). A conscious choice should be made at all levels of the organization to actively identify and pursue effective risk management during the life of the project. 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 (PMI, 2013).

Now days, Ethiopia is investing billions of USD to construct GERD infrastructures in the country.

- The Grand Ethiopian Renaissance Dam (GERD) is a large-scale hydropower dam project under construction on the Blue Nile since 2011 - although the construction contract between the contractor, Salini Impregilo, and the Ethiopian Electric Power Corporation, was signed by the Ethiopian government in December 2010. GERD construction project with a total project cost of ETB80bn ($4.7bn).The cost will be covered by the people and Ethiopian Government.

Looking into the above figures and facts one can easily consider how the country is becoming fund to undertake these GERD construction projects. Therefore the successful completion and operation of these GERD construction projects is a very significant and great achievement to the country.

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.

As stated above, to successfully complete GERD construction projects, like any other project endeavors, strong emphasis should be given to the overall project risk management practices and the project organization should be committed to address risk management proactively and consistently throughout the projects. In addition vigilant and watchful risk management practices should be made at all levels of the organization to actively identify risks and follow effective risk management practices during the life of the projects.

Since according to Flanagan et al. (1993) the process of taking a project from initiation to completion and bringing it into operation a complex process, the construction industry is subject to more risk and uncertainty than many other industries. So the proposed study aims to assess the project risk management practices of the GERD construction projects undertaken by EEP so that important lessons will be drawn and recommendations will be made for future project endeavors. The preliminary assessment and document review by the researcher revealed that GERD construction encountered major delays and cost overrun. One of the major contributors for such delay and cost overrun was inadequate project risk management. In this regard, standard risk management processes couldn't be effectively applied. These processes are risk planning, risk identification, risk analysis, risk response, risk monitoring and controlling. During document analysis also, the researcher found poor risk management plan, quantitative risk analysis and unclear risk response plan. In addition, the risk monitoring was performed without effective controlling of risks. Therefore, the researcher became initiated to undertake a research on assessing project risk management practices in GERD construction. Moreover, as far as the researcher's knowledge, research studies exclusively on project risk management practices in GERD.

1.4 Research Questions

1.4.1Basic Research Question

What was the practice of project risk management in GERD construction project?

1.4.2 Sub - Research Questions

- What was the practice of project risk management planning in GERD?
- How project risks were identified in GERD?
- What was the process of analyzing project risks in GERD?
- How to respond to project risks in GERD?
- What was the practice of risk monitoring and control in GERD?

1.5 Research Objectives

1.5.1 General Objective

The main objective of this study is to assess the project risk management practices of GERD construction projects undertaken by EEP.

1.5.2 Specific Objectives

The specific objectives of this study were:-

- To assess the project risk management planning process in GERD
- To discover the project risk identification practice in GERD
- To identify the project risk analysis in GERD
- To analyze the project risk response method in GERD
- To assess the project risk monitor and control process in GERD

1.6 Significance of the Study

Even if there are plenty of studies carried out to assess project risk management practices of the hydroelectric power dam construction sector, the number of studies undertaken regarding risk management practices of Grand Ethiopian Renaissance Dam (GERD) construction projects is hardly any. Therefore the study and the resulting lessons drawn from the analysis, by assessing the project risk management practices of dam construction projects, are likely to benefit EEP and different stakeholders which are very much involved in the emergent hydroelectric power dam sector. In addition the study's findings and recommendations are well important to

management of EEP future project undertakings to take corrective actions based on the identified possible ways of improving project risk management practices in the corporation. Finally, as well as outlining plans for implementing results from this research project, this document could also be used as a reference for future researches in the area.

1.7 Scope of the Study

The research did merely focus on hydroelectric power projects undertaken by Ethiopian Electric power in the country. Among other planned and under construction hydroelectric power dam projects, the proposed research was limited to assess only the project risk management practices of the Grand Ethiopia Renaissance Dam (GERD) progressed dam construction project.

1.8 Limitations of the Study

Even if EEP has a prospect strategic plan of constructing hydroelectric power dam, this paper will only assess the project risk management practices of the Grand Ethiopia Renaissance Dam (GERD) project. Lack of credibility of data collected from the secondary data sources could also be considered as another limitation of the research.

1.9 Organization of the Study

The research paper is organized in five chapters. The first chapter present introductory basic research information including the background of the study, problem statement, research objective, research questions, significance, scope and limitations of the study. The reviewed related literatures are immensely illustrated in chapter two. The third chapter covers the research design and methodology used in order to achieve the objectives of the study. The study presents analysis and interpretation of the data gathered in the fourth chapter. Finally, the report concludes with the conclusions of the study and recommendations that are made based on the major findings of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURES

This chapter contains the first feature of the research; the theoretical and empirical fundamentals of the research. It consists of definitions of relevant concepts and a broad review of the existing body of literature on project risk, risk management, risks in the construction sector and the overall risk management processes. This chapter will finally finish by demonstrating the overall conceptual framework followed by the study.

2.1 Theoretical Review

It is important to understand relevant concepts before they can be managed or knowledge about them can be developed. Therefore this part describes the theoretical rationale of project risk, risk management and reviews discussions on construction sector risks. Therefore this part will start the theoretical analysis with sections on defining risk, uncertainty, risk management and its corresponding facets.

2.1.1 Risk and Uncertainty

Risk is always present when making decisions on the basis of assumptions, expectations and estimates of the future. It characterizes situations where the actual outcome for a specific event or activity is likely to deviate from the estimated value (Raftery, 1994). The definition of risk is diverse and can be assessed in terms of fatalities and injuries, sample of a population, in terms of probability and reliability or in terms of the likely effects on a project. One can distinguish uncertainty from risk by defining risk as being where the outcome of an event is possible to predict on the basis of statistical probability. This implies that there is knowledge about a risk as a combination of circumstances as opposed to the term uncertainty in which there is no knowledge (Smith et al., 2006). Risk is often explained in terms of probabilities and consequences, or impact on various objectives. In order for a potential event to be considered a risk it must have a probability of between 0 and 1, which reveals a spectrum in which the event is either impossible or is certain to happen (Loosemore et al., 2006). Hence, the occurrence of risk is present when a decision is described in terms of a series of possible outcomes and when known probabilities can be attached to set outcomes (Smith et al., 2006).

Hillson and Murray Webster (2005) explain an interesting trend when examining various official published risk management standards. They state that the definition of risk had an exclusively negative connotation before 1997; hence risk equals threat, with the term being synonymous with hazard, danger and so on. Although, from 2000 onwards, the definition of risk presented in various publications in relation to risk management has changed, a clear majority of the official standards have unequivocally treated risk as including both opportunities and threats.

Risk – an uncertain event or condition that, if it occur has a positive or negative effect on a projects objectives (PMI, 2000)

Risk – exposure to the possibility of financial loss or gain, physical damage or injury, or delay as consequence of the uncertainty associated with pursuing a course of action (Chapman C. ,1991)

Risk – exist when a decision is expressed in terms of a range of possible outcomes and when known probabilities can be attached to the outcomes (Smith et al., 2006).

Uncertainty can be deemed as the chance occurrence of some event where the probability distribution genuinely is unknown, meaning that uncertainty relates to the incidence of an event about which little is known except the fact that it might occur. (Smith et al., 2006). Thus, it is the absence of information required for a decision to be made at a point in time (Winch, 2010). The occurrence of uncertainty is therefore present when an action leads to more than one possible outcome but the probability of each outcome is unknown (Smith et al., 2006).

It is essential to understand the relationship between opportunities and threats, especially in the context of project risk management (Hillson, 2004). The definition of risk does not necessarily refer to the chance of exclusively bad consequences. Instead it should also include the possibility of good outcomes (Smith et al., 2006). Both threats and opportunities are usually involved in any given decision situation, and both should therefore be managed. It is not advisable to concentrate on the reduction of potential threats without also considering associated opportunities. It is simultaneously not advisable to chase opportunities without regard for potential threats (Chapman & Ward, 2003).

Opportunities and threats both involve uncertainty, which has the potential to affect objectives. An opportunity can be defined as a set of conditions or an uncertain event that, if it occurs, would benefit the project. A threat however might be defined as an uncertain event or condition

that, if it occurs, would damage the project in some way. The only difference between them is the type of effect on objective. Given the similarity in description, it is reasonable to bring the two together under a common definition that combines the element of uncertainty with the potential to affect objectives, which is how risk is defined (Hillson, 2004).

2.1.2 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. A good RM procedure will support better decision-making concerning risk, as 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.

Risk management is set of coordinated activities to direct and control an organization with regard to risk (ISO, 2009).

Catriona, John and Peter (2000) reflected that the practice of risk management will involve identifying precautionary measures to avoid a risk or to reduce its consequence, establishing contingency plans to deal with risks if they should occur, initiating more investigations to reduce uncertainty through better information, considering risk transfer to insurers, considering risk allocation in contracts and setting contingencies in cost estimates, float in programs and tolerances or 'space' in performance specifications.

Catriona et al. (2000) investigated that the project organization and its senior management, internal &external clients and project managers are the major beneficiaries of the risk analysis and management practice. They further sketched out the following benefits of project risk analysis and management practices:

- An increased understanding of the project, which in turn leads to the formulation of more realistic plans, in terms of both cost estimates and timescales.
- An increased understanding of the risks in a project and their possible impact, which can lead to the minimization of risks for a party and/or the allocation of

risks to the party best able to handle them.

- An understanding of how risks in a project can lead to the use of a more suitable type of contract.
- An independent view of the project risks which can help to justify decisions and enable more efficient and effective management of the risks.
- Knowledge of the risks in a project which allows assessment of contingencies that actually reflect the risks and which also tends to discourage the acceptance of financially unsound projects a contribution to the build-up of statistical information of historical risks that will assist in better modeling of future projects.
- Facilitation of greater, but more rational, risk taking, thus increasing the benefits that can be gained from risk taking.
- Assistance in the distinction between good luck and good management and bad luck and bad management.

Project risk analysis and management is a continuous process that can be started at almost any stage in the life-cycle of a project and can be continued until the costs of using it are greater than the potential benefits to be gained. As time progresses, the effectiveness of using project risk analysis and management tends to diminish, therefore it is most beneficial to use it in the earlier stages of project (Catriona et al. 2000).

2.1.3 Project Risk Management Model and Process within the Construction Industry

There are many methodologies or models in regards to managing the risks in various projects but the core process of risk management is comprised into four stages in the construction industry. Identification and classification of the risk sources, risk assessment analysis, development of management responses to risk and to control and monitor them (Smith et al., 2006).

The method of risk management helps to observe and determine all the risks to which the project is exposed in hopes of making an aware decision that is pursued with the coordinated and economical application of resources, in order to control and reduce the effect and overall probability of events considered undesirable (Dehdasht et al., 2015) Thus transparency increases through risk management and the project can be prepared for unavoidable problems, also many problems can be averted from the outset through proactive measures (Schieg, 2006).

Loosemore et al (2006) describes risk management as a proactive process of looking forward as opposed to indicating a reactive framework. They state that the distinction is often confused within the construction industry where managers might think they are practicing risk management, but in reality they often demonstrate a backward looking and reactive approach. Winch (2010) describes the model as being designed in a circular fashion to emphasize that risk management is a learning process through time, using the same four elements or stages as Smith et al (2006) and Hillson (2004). In literature, the core principle of risk management is the same but the process might differ somewhat depending on the industry and organization, but the components illustrated in fig 3 are usually present. A systematic implementation of the process throughout the lifecycle, from planning to completion, of any construction project is needed in order for the practice to be truly beneficial, thus the process needs to be iterative (Loosemore et al., 2006). PMBOK's model differs by incorporating risk assessment with qualitative and quantitative risk analysis. The importance of feedback within each phase is emphasized in ISO 31000, in which monitoring and review ensures that the organization monitors risk performance and learns from experience.

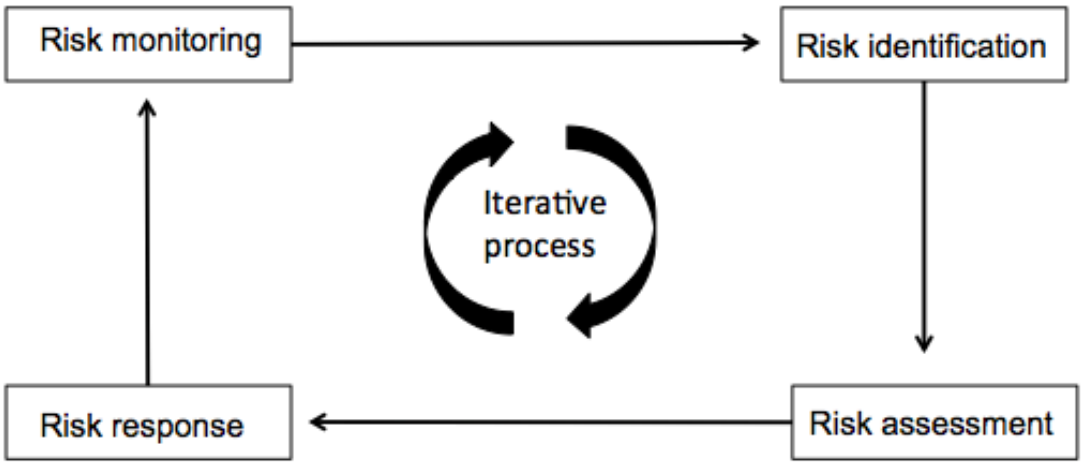

Figure 2.1The iterative process of Risk Management (Hillson, 2004)

Construction projects are from the start of their existence immediately exposed to risks (Schieg, 2006). Hence, the implementation of risk management from the early stages of a project is essential due to the fact that major decisions such as choice of alignment and selection of construction methods can be influenced during this stage (Eskesen et al. 2004). Other reasons for investigating risk events early in the project life is that useful information about the risks

might emerge enabling the implementation of a strategic approach to be defined and adopted as early as possible. This will in turn help clarify internal project goals and priorities as well as enabling an improved estimation of safety, budget and schedule (Reilly & Brown, 2004). By incorporating risk management into the planning phase one can facilitate the identification and reduction of potential risks for the project success (Schieg, 2006).

2.1.4 Risk Identification

The identification of risk is arguably recognized as the most crucial step within the risk management process (Banaitene & Banaitis, 2012). The aim is not to obtain perfect predictions of future events, rather it is the recognition of potential risk sources with high impact on a particular project, and should they occur. It is impossible to identify all potential risks and the purpose should not be to do so (Smith et al., 2006). Thus, the intention of identifying and assessing the risks is to ensure that potential risks are assessed and managed in a manner, which allows for the overall objectives to be achieved. Due to the constant changing nature of risks throughout a projects life cycle the management of risk must be an ongoing process (Potts, 2008). before risks can be managed they must be identified, and knowledge from previous experiences might apply to the current project (Karimiazari et al., 2010).

The descriptions of most risk management processes emphasize the need to identify the risks early in the process. Chapman and Ward (2003) discusses the need to identify sources and associated possible responses as well as secondary sources that arise from these responses. The quality of the primary identification phase within the risk management process has a big impact on the success of later phases within the process (Chapman R. , 2001). The initial step at the early phase of the project should form the basis by which strategies, policies, uncertainties and risks are established when it comes to management and allocation (Potts, 2008). However, given that all risks are not completely recognizable before the start of a project and the fact that additional risks might arise during the implementation of the project, the identification of risk must be implemented in a manner that is in line with the progress of the project as well as being forward-looking (Schieg, 2006). The PMBOK describes the importance of an iterative approach to the process of risk identification, and the development and implementation of simple and effective responses as soon as risks are identified. However, they also mention that there is no significant sense of an overall iterative process to filter out risks in need of cautious scrutiny.

The different methodologies regarding risk source identification usually consist of checklists, brainstorming, workshops, expert interviews and analysis of different scenarios as well as analysis of historical data and project plans. Furthermore, known unknowns and sources of risk and uncertainty should be documented (Klemetti, 2006). The usage of interviews with experienced project managers can be useful for solving and avoiding similar problems that might arise, all relevant participants in the project can be interviewed on factors affecting risk.

The method of using past experience or historical data from similar projects provides insights about common factors in a comparison between the projects. The usage of checklist is a simple yet useful tool which usually covers risks identified in previous projects and the associated responses to those risks (Mhetre et al., 2016).

Winch (2002) describes risk source identification being done through brainstorming sessions and that this phase generally relies on experience. Furthermore, he emphasizes the benefits of producing some kind of risk register that covers all known risks and recognizes from an uncertainty and risk perspective, what has to be managed. The authors Skitmore and Lyons (2004) described the former method as the most common and preferable risk identification technique. Smith et al (2006) further describes brainstorming as a method where team members within a particular project focus on the risks specific to the project, also stressing the importance of avoiding potential group or individual biases by carefully managing the process. In order to generate an enhanced and balanced project risk source assessment, and to avoid the fact that the group might have insufficient collective experience to identify key risks, a common practice is to use external consultants. The process of risk source identification as well as risk analysis may generally be viewed as the most essential phases of the risk management process given that these might have the strongest impact on the precision of risk assessment (Maytorena et al., 2005).

2.1.5 Risk Assessment

The identification of risk is only the first phase, some of the identified risks may be considered more significant and need to be further analyzed. The next step is to determine their significance quantitatively, before the response management stage.

The objective in risk assessment and analysis is to describe the risk situations as completely as possible and to prioritize them (Schieg, 2006). In general, there are two major categories distinguished in the literature on risk assessment, specifically qualitative and quantitative

analysis. The former is a process that consists of interviews, checklists and brainstorming while the latter is performed through a data driven methodology (Banaitene & Banaitis, 2012). Risk assessment through quantitative analysis defines the impact of each risk in the spectrum of high and low and the probability of occurrence. Whereas qualitative risk assessment often involves the evaluation of impact and the development of lists in order to further analyze the highlighted risks (X.W Zou et al., 2007). The assessment of risks through both types of analysis should transpire on an individual level as well as include the interrelationship of their effects (Schieg, 2006).

It is essential that the major predictable risk factors are quantified and effectively analyzed. The impact of potential risks might be a duration increase resulting in delays, productivity decrease, and a cost increase of an activity among many others. Given that resources might be shared among different projects it may be common that disturbance in one project can result delays in other projects. Subcontractors may also cause delays (Schatteman et al.,2008).

2.1.5.1 Methods for Conducting Risk Assessment and Analysis

Bahar et al (1991) describe the first step in risk analysis and evaluation process as the collection of relevant data to the risk exposure, which might be historical data collected through past project experience by the contractor. Furthermore, they describe the modeling of uncertainty of a risk exposure where the likelihood of occurrence is presented in terms of probability and potential consequences in financial monetary terms. Having formed the uncertainty of various risk events the next step according to them is to assess the overall impact of these risks, through techniques such as Monte Carlo simulation.

The quantification of risks is the magnitude and frequency of each event and every event can be a collection of incidents or a single incident. In order to quantify and evaluate the risks one can implement various analysis methods, everything from subjective estimation to probability analysis etc. (Williams, 1995).

One of the most common used methods for assessing risk sources according to Winch (2010) is the probability and impact matrix as illustrated in figure. The classification of the risks is made in terms of their probability of occurrence and the extent of their impact. It allows a prioritization of the risks on the project in terms of them being manageable or not. Qualitative

high to low scales can be used for the assessment of known unknowns as well as the subjective assessment of known as presented in fig (Winch, 2010). PMI (project management institute) describes the probability and impact as dimensions of risk that are applied to specific events, as opposed to the overall project.

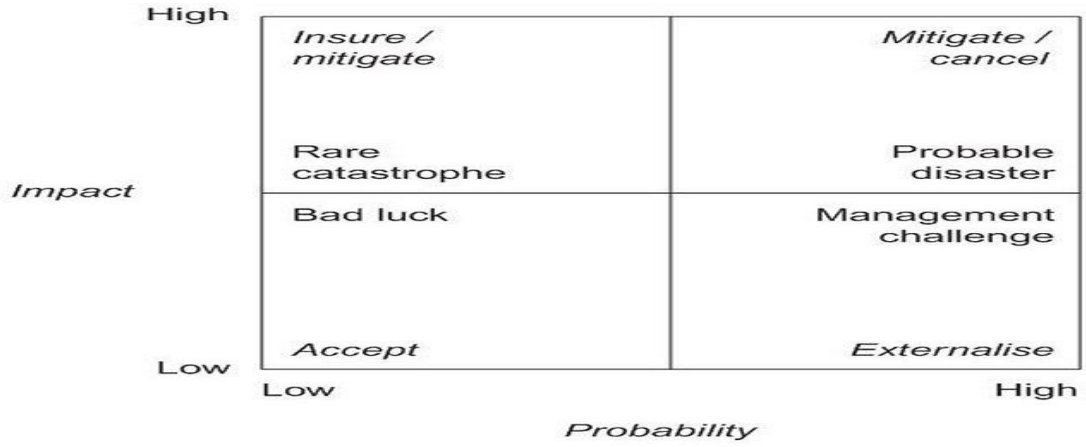

Figure 2.2 Illustration of probability & impact matrix (winch, 2010)

The usage of a risk matrix as shown in fig 2.2.is often applied when dealing with static risk, i.e. risks that only have a negative effect. It resembles the probability matrix described above. A decision on how the risk is going to be dealt with is made depending on where the risks end up in the matrix. Each particular project dictates what type of risk that is acceptable or unacceptable and the colors areas should be determined with the project in mind (Flanagan et al, 2007).

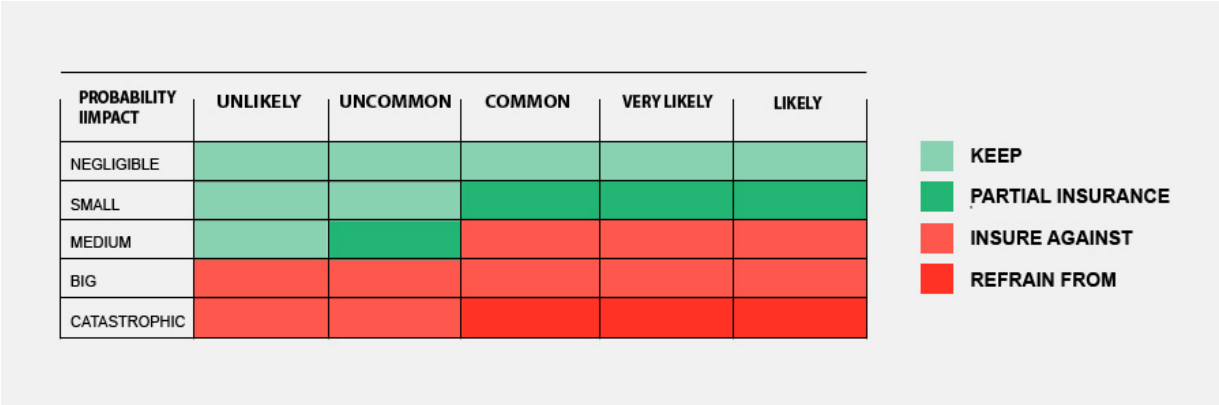

Figure 2.3 Illustration of a risk matrix (Flanagan et al, 2007)

By positioning various risks on the matrix it facilitates an overall view of them, which makes the most urgent and important risks more visible. Additionally, it helps to indicate if the risks can be mitigated through a decrease of their probability or of their consequences (Chan & Wang , 2013).

2.1.5.2 Qualitative and Quantitative Analysis

A compilation of the most commonly used methods when assessing the identified risks is listed below, including a description of each one.

2.1.5.3 Qualitative Methods

Probability & impact assessment: can be applied in order to evaluate the likelihood of a specific risk to occur. The risk impact on project objectives is assessed in terms of opportunities and positive effects as well as threats and negative effects. It is important to adapt and define the probability and impact to the specific project.

Risk matrix method: can be used additionally by having probability and impact as a basis for further analysis. The priority score can be computed as the average of the probability and impact and the priority score range, rate and color are given to illustrate each risk's significance. The high priority score threats, meaning high impact and likelihood, are viewed as high-risk and could necessitate an urgent response while low scored threats could be further monitored and given attention only if needed.

Risk categorization: is applied as a way to systemize the threats according to their sources, in hopes of identifying areas with the highest exposure to those risks. The usage of this method breaks down activities into small units and creates hierarchical series of activities, additionally the method can include risk dependencies and a prioritization of them depending on how quick response they require (Flanagan et al, 2007).

2.1.5.4 Quantitative Methods

Sensitivity analysis: is implemented in order to identify uncertain components in the project, which will have maximum impact on the outcome. The aim is to look at the sensitivity of various elements of the risk model on project outcome, by changing the values of one variable at a time and then showing the impact on the project (Mhetre et al., 2016)..

Probabilistic analysis: is a method used to show the potential impact of different level of uncertainties on project objectives. It quantifies the effect of risks on project schedule and budget and it uses three point estimates such as worst case scenario, most likely scenario and finally best case scenario for each task. Monte Carlo Simulation is most often used for this type of analysis (Mhetre et al., 2016).

Decision trees: is a useful method to frame the problem and evaluate various options. The usage of this method consists of decision tree diagrams used to represent the project and show the effects of each decision (Mhetre et al., 2016).

2.1.5.5 Risk Register

The risk database as shown in fig 5 is a central tool in risk management for monitoring the risk management process (Cooper et al., 2005). The design of the register depends on the organization, the type of projects and the people involved. It is essential that the organization creates a customized version of the register that suits them in order for it to be fully used as intended, as opposed to being an additional burden in a demanding work schedule. In order to facilitate registration, storage, management and sorting of information the register should be incorporated in a database (Flanagan et al., 2007). All the identified risks and results of their analysis, associated action plans and evaluation as well as the status of the particular risk are registered within this list. Throughout the entire project life cycle there should be updates and reviews of the risk register. The register is a central component because it facilitates monitoring and correcting progress on risk mitigation measures, it helps identify new risks and close down expired risks as well as adjusting the assessment of existing risk etc. (Potts, 2008) Risks that are no longer relevant due to avoidance or if they already are managed can be removed from the register together with the associated action plans. The status of action plans and specific risks should be reviewed consistently (Cooper et al., 2005).

According to (Schieg, 2006) new additional risks, risk status and the progress of the measures are required to be included. The risks that already have occurred must be documented including the amount of damage they have produced. Furthermore, he states that a big part of the monitoring of risk (which is the last phase) is the internal control system, where the responsibility of monitoring early indicators is allocated to specific people. In order for this process to work effectively there should be a reporting and meeting arrangement in place for the project and the organization as a whole.

2.1.6 Risk Response

The third step in the process of risk management signifies what actions should be taken towards the various risks and threats previously identified (Mhetre et al., 2016) The planning process of risk response is defined by PMBOK as the development of options and determining actions to enhance opportunities as well as reduce threats to the project objectives. This process involves the assignment of parties to take responsibility for each agreed risk response, and the efficiency of this phase will determine if the risks increase or decrease for the project. Literature suggests that there are mainly four risk mitigation strategies that can be implemented in order to reduce exposure to the risks associated with a project.

Mills (2001) provides an example where incorporated risk control measures resulted in an added value, showing how risk and opportunity go hand in hand. The example he gave was an instance where a hoist was provided instead of ladders to reduce the risk of people falling. The additional benefit from the risk control measures taken was an increase in people's mobility and in turns their productivity. Hence, illustrating a example of potential opportunity arising from risk.

2.1.6.1 Avoidance

A response in form of avoidance can be justified if the risk is estimated to have serious consequence on such level that may warrant a reappraisal of the entire project (Potts, 2008). One can use avoidance to cope with risk by changing project plans in a way that makes the risk irrelevant (Klemetti, 2006), it might be necessary to reappraise the concept or maybe cancel the project. This method promotes changing project plans to facilitate the elimination of the risk or to protect the project objectives from the potential negative impact. An example might be avoiding an unfamiliar subcontractor (PMI, 2000). Other examples are extending the schedule or reducing the scope of the project (Karimiazari et al., 2010). The aim of risk avoidance might also be to reduce the risk via contractual countermeasures. Additional measures that can be taken into account is procedural changes, regular inspections, skill and training enhancement, more detailed planning, preventive maintenance and the selection of alternative approaches (Cooper et al, 2005).

2.1.6.2 Transfer

This response approach involves transferring the risks and consequences to third parties who are willing to accept responsibility for its management and the liability of the risk (Mhetre et al., 2016). This method is most effective in regards to dealing with financial exposure to risk. It includes the use of both contracts and insurance to transfer liability to other parties, for instance by contractor to subcontractor and often involves payment of risk premium to the party that is taking on the risk and responsibility of the consequences (PMI, 2000). In order to avoid secondary risk in case the agent (third party) fails to meet obligations, the transfer should only be done when the agent is in a better position to manage the risk than the principal (Winch, 2010).The main purpose is to ensure that the risk is owned and managed by the party best able to handle the task successfully (Mhetre et al., 2016).

2.1.6.3 Mitigation and Reduction

This approach means to mitigate the risk by changing the scope of the project to minimize the likelihood of the damaging event occurring (Winch, 2010). Implementing risk management early in the project to reduce the probability of the risk event occurring is more effective than trying to repair the damage and consequences after the risk has passed. The mitigation of risk may be done by adopting less complex processes or changing conditions so that the probability of impact is reduced, other forms of action is adding resources and extra time to the schedule (PMI, 2000). Flanagan et al (2007) describes implementing an altered construction method and the use of other materials to reduce potential risks, or executing a new or more detailed planning. Additional reduction strategies include contingency planning, quality insurance, separation or relocation of activities and resources. In practice these categories might often overlap in some fashion as in this case where insurance also can be a mitigation strategy, sharing characteristics with risk transfer (Cooper et al., 2005). However, risk reduction can only be used a few times in a project before the project might become unmanageable (Flanagan et al., 2007).

2.1.6.4 Acceptance

It is impossible in reality to take advantage of all opportunities and eliminate all threats to the project, but it is possible to at least be aware of the threats and opportunities through the documentation and identification of them. The usage of this strategy is justified when it is not possible to respond to the risk by the other strategies, or when the grandness of the risk makes a response unreasonable (Mhetre et al., 2016). This risk response approach essentially means taking a conscious risk and to deal with the consequences as they occur. This indicates a decision not to change any project plans in order to deal with the risk or engaging in any other response strategies (Cooper et al., 2005).As described above the risk response stage involves planning and execution and should be iterative. Having an effective control process adjacent can ensure the correct execution of this phase (Klemetti, 2006). When it comes to specifically high-impact risks but also with all types of risks, one of the most beneficial risk management strategies is to delay the decision until more information comes to light (Winch, 2010).

2.1.7 Risk Monitoring

Continuous monitoring and review of potential risks is an important in regards to the implementation of the risk management process. It guarantees new risks are detected and managed. The project manager should monitor a list of the major risks that have been identified for risk treatment action, which should be a primary tool used management meetings (Cooper et al., 2005).

This is the final phase of the process and it is equally important as the others. Given that more information emerges one can reassess the probability and impact of the risks, and once the potential risk event has been passed they can be removed from the risk register (Winch, 2010

2.1.8 The Attitudes toward Risk

The subject of various attitudes towards risk is important since it is key to understanding behaviors associated with activities related to risk management (Baranoff & Kahane, 2009). Therefore, in order to investigate the decision-making behaviors of decision makers within the domain of construction risk management, a good understanding about their risk attitudes needs to be established (Wang & Yuan, 2011). Especially since the lack of knowledge retention and communication has always been a serious problem for the construction industry (Liu et al. 2007). there are three types of attitudes towards risk according to literature, these are the following: Risk-averse, risk-neutral and risk-seeking. People have different attitudes towards risk and the individual's particular attitude will determine the way that they perceive risk and how they respond to risk (Raftery, 1994). Attitudes are valuable in enhancing the self-esteem of a person and serve to express an individual's self-identity and guiding values. They are therefore important to managers because they determine the direction of people's behavior in response to a particular stimulus and provide insights into motivating mechanisms. Individuals' attitude is based on their own positive or negative evaluation, beliefs and knowledge about the consequences of a certain behavior (Teo & Loosemore, 2001). Thus, peoples risk attitudes is a reflection of their personal experience and characteristics as well as the management environment in which they belong to. This explains why different project managers make different, and sometimes even opposite judgments in the same decision situations (Wang & Yuan, 2011). Winch (2010) describes project managers' preferences in regards to risk as their propensity or appetite for the level of risk and uncertainty they are willing to accept. The model presented by Winch is based on the three different attitudes as previously stated and allows the identification of various decision making criteria in terms of risk profiles.

2.1.8.1 Risk-averse

People and groups are risk-averse when they are uncomfortable with uncertainty. The characteristics of this type of attitude are common sense and support of established methods of working. The presence of threat causes discomfort and leads to increased sensitivity leading to a preference for aggressive risk responses in order to minimize the risks.

However, a risk-averse attitude might underrate the significance of potential opportunities (Hillson & Murray-Webster,2005).They desire to have to have as much security as is reasonably affordable in hopes of lowering the level of distress (Baranoff & Kahane, 2009).

2.1.8.2 Risk-neutral

Individuals and groups with a risk-neutral attitude pursue strategies that have high future pay- offs. Hence, they view present risk-taking as a price worth paying given the future benefits the characteristics of this type of attitude are fearlessness in face of change and the unknown, instead they visualize possibilities. The risk-neutral approach focuses on longevity when it comes to threats and potential opportunities. Thus only taking action that is expected to result in significant benefits (Hillson & Murray-Webster, 2005).

2.1.8.3 Risk-seeking

People and groups that embody a risk-seeking attitude tend to have a slightly casual approach towards the presence of threats. During the risk process the risk-seeking individual inclines to identify fewer threats due to their framework in regards to risk. Threats are likely to be underestimated when it comes to potential impact and probability of the event occurring. In regards to possible opportunities, risk-seeking attitudes might overestimate their importance and pursue them in an aggressive manner (Ibid.).

The definition of attitude is twofold, the first relates to the inner working of the human mind where attitude is the mental view with regard to a fact. The second definition describes the direction of lean; this may be seen as a metaphor for the internal approach adopted by a group or individual towards a particular situation. Some attitudes are deeply ingrained and some are more malleable but they nevertheless represent a choice, hence they are situational responses and may differ depending on influences. The possibility of changing the attitudes is introduced if the influences are identified and understood. Attitudes are therefore not fixed inherent attributes of individuals or groups, rather they can be modified which is essential to the case of understanding and managing risk attitudes (Hillson & Murray-Webster, 2005).

A survey presented by Akintoye and Macleod (1997) showed that the majority of contractors perceived risk as the likelihood of unforeseen factors occurring, which could adversely affect the successful completion of the project in terms of cost, time and quality. Only one contractor saw risk as an opportunity instead of an event that will always have adverse effects. Wang and Yuan (2011) conducted a study presenting the critical factors affecting risk attitudes of contractors in the context of the Chinese construction industry. The factors considered most important where categorized into groupings such as knowledge and experience, contractor's character, personal perception and economic environment. By deepening the understanding of the various factors that affect contractors risk attitudes, further support in regards to decision making can be facilitated.

2.2 Empirical Review

Many researchers have conducted a lot of assessments to identify the major types of risk to be faced by construction projects in general and a GERD construction projects specifically. This part of the research will present findings of the researchers regarding risks in the construction projects sector.

2.2.1 Risks in Construction Projects

The Construction Regulations (2007) defined construction works as the carrying out of any building, civil engineering or engineering construction works.

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 and Mahelet, 2009).

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 and Clough, 2008).

The construction industry has been characterized as dynamic in nature as a result the increasing uncertainties in technology, budgets, and development processes. In recent time, building projects are becoming much more complex and require a careful integrated process management tools and techniques (Abdelnaser, Mohammed and Abdelwahab, 2012).

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.

The theoretical study of global construction project risk is accompanied by the formation and development of the global construction project market. As early as during the Second World War, risk analysis techniques were being applied in the field of systems engineering and operations research. Risk analysis techniques for construction project management began in the 1950's. Along with the post-war reconstruction in Western societies, especially in the economic recovery of Western Europe, a large number of large-scale space, utilities, energy and transportation construction projects were built in Europe. The huge investment made the project managers pay more and more attention to cost management, and the complex project environment made the project face a lot of uncertainty. How to identify and assess the uncertainty on the impact of project cost became a major problem of managers (Kyle Costa2009, Page 27).

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.

Different researchers have made various classifications regarding risks occurred during construction project undertakings. 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. Table 2.1 below will briefly show the risk classification made by Ebrahimnejad et al. (2008):

Table 2.1: Risk Breakdown Structure

WBS – Level 0	**WBS – Level 1**	**The initial Risks**
Management	-	1- Project management disabilities 2- Lack of attention to law and regulations 3- Economical inflation 4- Fluctuating currencies exchange rate 5- Increase in international crude oil price 6- Lack of attention to contract requirements 7- Communication matters between consortium
Engineering	Basic Design Detail Design	1- Inaccessibility to foreign design consultants 2- Design failures 3- Change in project specifications 4- Failure in transmitting data from basic design to detail design
Procurement	Equipment and Bulk Material Long Lead Items Spare Parts	1- International relations 2- Ambiguity in project cash injection 3- Inappropriate vendor list 4- Incorrect long lead item time schedule
Construction	Site Preparation Camp Construction	1- Soil and site bed problems 2- Unsuitable weather conditions

	Site Establishment Plant Construction	3- Heavy lifting matters 4- Health, Safety and Environment matters 5- Workers riots 6- Lack of communication between central office and site office 7- Change in construction scope of work 8- Lack of experienced workers 9- Contagious diseases
Commissioning	Pre-commissioning Commissioning	1- Non-consideration of pre-commissioning requirements 2- Lack of pre-commissioning materials quality 3- Non-consideration to commissioning procedures

Source: Ebrahimnejad et al. (2008)

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 IMCA (2006) there are seven major risk areas in construction projects namely; contractual, performance, financial, political, technical, geographical and operator. Each risk areas have their own risk triggering factors.

Even if there will always be an overlap between these areas, the main areas of risk in construction contracts according to IMCA (2006) are discussed in the table below:

Table 2.2: List of Main Risk Areas of Construction Projects

Main risk Areas	Risk factors
Contractual	▪ Operator group and contractor group property and personnel ▪ Project works (including both Operator and contractor supplied items) ▪ Pollution ▪ Third parties ▪ Consequential losses ▪ Warranty obligations ▪ Delay ▪ Variation orders ▪ Free access to worksite ▪ Intellectual property rights ▪ Termination by operator for convenience ▪ Operator's obligation to pay Contractor. ▪ Insurance cover ▪ Force majeure and suspension ▪ Unlimited liability/damages at large
Performance	▪ Scope, nature and duration of work ▪ Schedule interactions ▪ Size ▪ Safety and environmental performance ▪ Weather

	▪ Soil and foundations ▪ External influences ▪ Operator and influences at time of bid
Financial	▪ Profitability ▪ Foreign currency exposure ▪ Balance sheet debt ▪ Value of contract (size) ▪ Terms of payment ▪ Off-balance sheet debt ▪ Operator creditworthiness ▪ Level of exposure ▪ Insurance
Political	▪ Interference ▪ Confidentiality ▪ Disturbance ▪ Permits and licenses
Technical	▪ Quality ▪ Weather ▪ New technology ▪ Soil and foundations
Geographical	▪ Location of the work
Operator	▪ Operator areas of influence ▪ Insurance ▪ Problems which impact the operator and can impact the contractor

Source: IMCA Risk Guideline (2006)

Further review of related literatures indicates that depending on the project scope, types of risks may differ among investments. According to Krantikumar, Konnur and Amarsinh (2016), risks associated with the construction industry can be broadly categorized into eight major categories and are discussed below:

1. **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.
2. **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.

3. **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.
4. **Organizational Risks**: the organizational risks consist of contractual relations, contractor's experience, and attitude of project participants, inexperienced work force and communication.
5. **Financial Risks**: increased material cost, low market demand, exchange rate fluctuation, payment delays and improper estimation taxes etc. are related to financial risks.
6. **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.
7. **Environmental Risks**: includes natural disasters and weather implications.
8. **Management Risks**: includes change in top management, internal management problem, team work and project delay

2.2.2 Risk Management in Hydroelectric dam Projects

Risk management is an ongoing and iterative process which should be conducted throughout the lifecycle of a hydroelectric project. Risk management is a systematic way of identifying, analyzing and responding to risks to achieve the objectives of hydroelectric dam project in terms of time, cost, quality, safety and environmental sustainability. Risk management is probably the most difficult phase of project management. Managing risks in construction of hydroelectric dam projects has been recognized as a very important process in order to achieve project objectives. Risk management in hydroelectric dam projects includes: risk identification, risk analysis, risk response planning, risk monitoring and control. Risk identification is the first and most important step in risk management process as it identifies the source and type of risks. Risk identification develops the basis for next steps of risk management process. A large number of tools and techniques exist for risk identification such as: Brainstorming, Risk checklists, Interviews, Questionnaires, past experience, Delphi techniques, Visit location, Historical data from similar projects, Study specialist literature (Kansal and Sharma, 2012). Considering the different factors GERD presents environmental risks, technical potential for political antagonism and its somewhat patchy financing

2.3 Conceptual Framework

The research will mainly focus on the concepts of project risk and risk management practices of GERD construction projects in Ethiopia. The questionnaire is used as a main tool to collect primary data and check the extent to the risk management practices are being carried upon by the GERD construction. This research assessed the practice of project risk management. In this regard, plan risk management (PRM), identify risk (IR), risk analyze (RA), responding to risk (RR) and risk monitoring and control (RM&C) were the key elements which the study has taken into consideration.

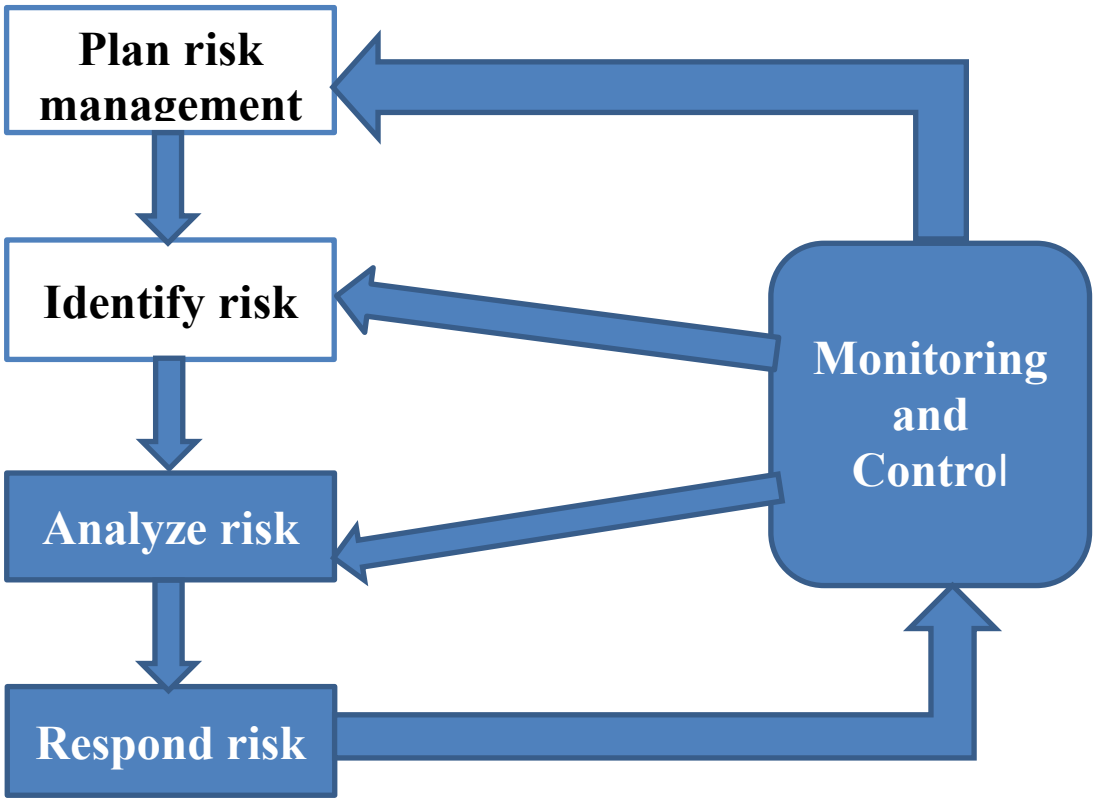

Figure 2.4 Summarized conceptual framework for project risk management process

Source: Developed based on the objective and literatures reviewed

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This research was bounded by time. So it was a cross sectional research and categorized under a descriptive type. According to Kothari (1990), descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group. This design enabled the researcher to assess project risk management practices of GERD construction. To obtain valid information, achieve the objectives of the study and ensure that the limitations of one type of data are balanced by the strengths of other both quantitative and qualitative approaches has been applied in the research. Hence the research design is mixed in its approach.

3.2 Type and Source of Data

In order to obtain relevant information and clearly address research objectives both primary and secondary sources of data are used. Primary data is collected using questionnaires with both open ended and closed ended questions to the respondents that were selected through simple random sampling and detail desk studies. Secondary data is collected by reviewing archival records, contract documents, published works, journals and related articles that contributed to better understanding of the research topic.

3.3 Sampling Design

The selection of respondents is limited to140 workers of EEP, which is the total population of the study, including contract administration personnel, resident engineers, project personnel, finance experts, legal experts and other related department staff. Simple random sampling technique is used to select respondents to this study.

3.4 Sample Size Determination

This study applied the simplified formula provided by Yamane, (1967) to determine the required sample size at 95% confidence level, degree of variability = 0.05.

Where:

n = Desired sample size

N =Total population size (140 in this case)

e = Accepted error limit (0.05) on the basis of 95 percent degrees of confidences put into decimal form

$$n = \frac{N}{1 + N*(e)^2}$$

$$n = \frac{140}{1+140*(0.05)^2}$$

n=103.7

n~104

3.5 Methods of Data Analysis

All the collected data was analyzed using descriptive data analysis method. Data collected through interviews was analyzed by using description of facts. And those quantitative data collected through questionnaires was analyzed using SPSS version 25 with frequency, percentage, mean and standard deviation. To make the analysis accurate, reliability of data was assessed using Cronbach Alpha test. Accordingly, the Alpha test scored for the assessment of general practice of risk management practice (0.966), risk planning practice (0.966), risk identification (0.947), qualitative risk analysis (0.952), quantitative risk analysis (0.961), risk response (0.915), risk monitoring and control (0.964) respectively. In addition, the quantitative data was triangulated with the qualitative data. Moreover, adequate steps were taken to ensure the validity of the questionnaire. For its validity, content validity was determined. Finally, the results was presented through tables

3.6 Data Analysis and Presentation

The collected data is analyzed using both qualitative and quantitative data analysis techniques. The data collected from close-ended questions of the questionnaire is analyzed by descriptive data analysis methods using Statistical Package for Social Science (SPSS) software version 25. Statistical results like mean score, frequency of occurrence, ratio and percentages will be displayed in a tabular format followed by discussions. On the other hand, the data obtained using open ended items of the questionnaire are analyzed by organizing the common ideas and concepts of the response into a meaningful format.

3.7 Ethical Considerations

In order to secure the consent to the study, the researcher clearly communicated the purpose and aim of the study to respondents. In addition, the researcher has notified the participants to participate in the research willingly and not to disclose their names to assure anonymity of data. Moreover, the researcher requested GERD to do the research formally and did the project by getting permission.

3.8 Data Validity & Reliability

To ensure the quality of the research and make the findings credible; due care is given to both validity and reliability issues of the data, the research process in general as well as the research output. To check the questionnaire's validity selected experts in project risk management are approached and invited to comment on the questionnaire as a pre-assessment means. To check the questionnaire item's internal consistency, its reliability was checked by the Cronbach's alpha test coefficient using SPSS software and the gained result was 0.947 which is beyond 0.70a result considered as "acceptable" in social science researches.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

This chapter presents the result of the data obtained from the respondents while assessing Project Risk Management practices of GERD using questionnaire and interview. The questionnaire was developed using Likert scale; where 1 represents Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 Strongly Agree. The purpose of easy analysis and interpretation, the mean values of each item and the grand mean were interpreted by taking into account the acquired project resources. Hence, the mean values from 1.00-1.50 were represented as very poor, from 1.51-2.50 were represented as poor, from 2.51-3.50 as fair, from 3.51-4.50 as good, and from 4.51-5.00 as very good. The results are presented by using descriptive statistics. To analyze the collected data SPSS Statistics version 25 was used. In addition, the result obtained from the interview also analyzed by relating to literatures. The collected data is summarized as follows.

4.1 Questionnaire Response Rate

Questionnaires with both open and close ended questions were designed and distributed for the research purpose. Out of the totally distributed 104 questionnaires, 94 were filled and returned. The interview question was prepared for senior managers that were 5 in number. Table 4.1 below will show the respondents' response rate through displaying the number of questionnaires distributed to the respondents and returned

Table 4.1: Summary of Number and Percentage of Questionnaires Distributed and Returned

Questionnaires	Questionnaires	Questionnaires	Response Rate
104	94	10	90.4

Source: Own Survey (2021)

4.2 Demographic Information

This part provides demographic information about the respondents' age in years, educational background, work experience in projects

Table 4.2 Demographic Information

Demography	Description	Frequency	Percent	Valid
Age in years	21-30 years			
	41-50 Years	34		36.2
	31-40 years	40		42.5
	Total	**94**	**100**	**100**
Educational	Bachelor Degree		59.6	59.6
	Masters		40.4	40.4
	Total	**94**	**100**	**100**
Work Experience in	1-2 Years			
	2-3Years		21.3	21.3
	more than 3 Years	62	65.9	65.9
	Total	**94**	**100**	**100**

Source: Own survey, 2021

Table 4.2 depicts that among 94 respondents 40(42.5%) of them were in 31- 40 years age group and 34(36.2%) of them were in 41- 50 years age group while the rest 20(21.3%) respondent was in in 21- 30 years age group. This implies that majority of the respondents were above 31 years old. According to table 4.1, respondents that acquired master's degree were 38(40.4%) and bachelor's degrees were 56(59.6%). This reveals that majority of the respondents had bachelor's degrees.

Table 4.2 also shows respondents work experience in projects. Accordingly, 62(65.9%) of the respondents have more than 3 years and 20(21.3%) have 2-3 years while the rest 12(12.8%) respondent has 1-2 years of work experience in projects.

4.3 General Project Risk Management Practice

This part provides general project risk management practice.

Table 4.3 General Project Risk Management Practice

General activities in project risk Management	Likert scale					Mean	Std. Deviation	N
	1	2	3	4	5			
There is a specific department/Work unit responsible for project risk	-	14.6	10.1	52.8	22.5	3.83	0.944	89
Project team have deep project experience in risk management	37.1	48.3	-	14.6	-	1.92	0.980	89
There is documented risk register from previous projects that support project team in risk identification and analysis	30.3	49.4	6.7	13.5	-	2.03	0.959	89
Risks are identified during work break down structure(WBS)	-	12.4	-	60.7	27.0	4.02	0.879	89
There is a policy and procedure that guide the project team to go through a disciplined risk management process	36.0	41.6	11.2	11.2	-	1.98	0.965	89
Project teams are motivated in the process of project risk management	34.8	46.1	-	19.1	-	2.03	1.060	89
Grand mean						2.64		

Source: Own survey, 2021

In table 4.3, Six (6) issues were raised to assess the general practice of project risk management in Grand Ethiopia Renaissance Dam (GERD). In the first issue, respondents were asked if there was a specific department/Work unit responsible for project risk management practices, majority of them 75.3% were agreed and strongly agreed there was a specific department/Work unit responsible for

project risk management practices., 10.1% were neutral and 14.6% were disagreed that there was a specific department/Work unit responsible for project risk management practices. Moreover, the mean value obtained for this issue was (3.83).This implies that the practice was good.

In the second issue, respondents were asked if project team have deep experience in risk management, 14.6% were agreed but majority of them(85.4%) were disagreed and strongly disagreed that project team have deep experience in risk management. A mean score obtained in this regard was (1.92). This implies that the practice was poor. Similarly, the interviewee also confirmed that practice of training and development in risk management was weak. Hence, they couldn't acquire deep experience in project risk management.

In the third issue, respondents were asked if there was documented risk register from previous projects that support project team in risk identification and analysis. In this regard, 6.7% were neutral and 13.5% was agreed, but majority of them (79.1%) were disagreed and strongly disagreed that there was documented risk register from previous projects that support project team in risk identification and analysis. In addition, the average response obtained in this issue was (2.03). This implies that the practice was poor. Similarly, the interviewee declared that the culture of documenting risk register of previous projects was weak.

In the fourth issue, respondents were asked if risks were identified during work break down structure (WBS), 12.4% were disagreed but majority of them (87.7%) were agreed and strongly agreed that risks were identified during work break down. A mean score obtained in this regard was (4.02).This shows that the practice was good. Similarly, the interviewee stated that risks were identified during WBS.

In the fifth issue, respondents were asked if there was a policy and procedure that guide the project team to go through a disciplined risk management process, 11.2% were neutral and11.2% agreed,but majority of them(77.6%) were disagreed and strongly disagreed that there was a policy and procedure that guide the project team to go through a disciplined risk management process. A mean score obtained in this regard was (1.98). This implies that the practice is poor. Similarly, the interviewee added that the organization risk policy and procedure was prepared in a generic way not specific to the project. Therefore, there was no any formal procedure that guides the project team to go through a disciplined risk management process.

In the sixth tenth issue, respondents were also asked if project teams were motivated in the process of project risk management. In this regard, 19.1% were agreed but majority of them (80.9%) were disagreed and strongly disagreed that project teams were motivated in the process of project risk management. A mean score obtained in this regard was (2.03). This implies that the practice is poor. Similarly, the interviewee also support the result obtained from the questionnaire in that the project team was selected from different functional departments and they were responsible and accountable both to the project and their functional unit. However, there was no any motivation that encourages them to manage risks effectively.

The grand mean (2.64) and the result obtained from interviewee revealed that the organization's risk policy and procedure was insufficient for project risk management. In addition, the project teams had lack of adequate experience in risk management, motivation and documented risk register from previous projects. As a result, they failed to go through a disciplined risk management process. Hence, the practice of project risk management became fair. Therefore, this is a lesson for GERD to amend its risk management practices for future projects.

4.4 Risk Planning Practice

Table 4.4 Risk Planning Practice

Risk Planning Activities	Likert scale					Mean	Std. Deviation	N
	1	2	3	4	5			
The risk management plan has obtained agreement and support from all stakeholders	42.7	33.7	23.6			1.81	0.796	89
The risk plan ensures that the degree, type, and visibility of risk management that commensurate with the project plan	51.7	27.0	21.3			1.70	0.803	89
The risk management methodology including the tools and data sources that may be used in the risk management process are established	40.4	31.5	10.1	18.0		2.06	1.112	89
The roles and responsibilities of the various project stakeholders participating in the risk management is clearly established	27.0	43.8	22.5	6.7		2.09	0.874	89
Grand mean						1.92		

Source: Own survey, 2021

In table 4.4, four (4) issues were raised to assess the practice of project risk planning. Accordingly, in the first issue, respondents were asked if the risk management plan had obtained agreement and support from all stakeholders. In this regard, 23.6% were neutral but majority of them (76.4%) were disagreed and strongly disagreed that the risk management plan had obtained agreement and support

from all stakeholders. In addition, the average response obtained in this issue was (1.81).This implies that the practice was poor. Similarly, the interviewee explained that the project didn't have stakeholder management plan and all stakeholders were unable to participate in risk planning.

In the second issue, respondents were asked if the risk plan ensured the degree, type, and visibility of risk management that commensurate with the project plan, 21.3% were neutral, but majority of them(78.7%) were disagreed and strongly disagreed that risk plan ensured the degree, type, and visibility of risk management that commensurate with the project plan. In addition, a mean score obtained in this regard was (1.7). This implies that the practice was poor. Similarly, the result obtained from the interviewee revealed that the risk management plan didn't follow standard project management practices and as a result its alignment with the project plan had limitation in visibility and clarity.

Regarding the third issue, respondents were asked if the risk management methodology including the tools and data sources that may be used in the risk management process was established, 18% were agreed, 10.1% were neutral but majority of them (71.9%) were disagreed and strongly disagreed that the risk management methodology including the tools and data sources that may be used in the risk management process was established. Moreover, the mean value obtained for this issue was (2.06). This implies that the practice was poor. Similarly, the questionnaire result agrees with the result obtained from the interview.

In the fourth issue, respondents were asked if the roles and responsibilities of the various project stakeholders participating in the risk management were clearly established, 6.7% were agreed and, 22.5% were neutral but majority of them (70.8%) were disagreed and strongly disagreed that the roles and responsibilities of the various project stakeholders participating in the risk management were clearly established. Moreover, the mean value obtained for this issue was (2.09). This implies that the practice is poor. Similarly, the interview and document analysis by a researcher revealed that roles and responsibilities of the various project stakeholders lack clarity. It only shows to whom the risk is escalated.

The grand mean(1.92) and the result obtained from interviewee revealed that all stakeholders weren't participated and even the roles and responsibilities of the project teams wasn't clearly stated in the risk plan. In addition, the risk management methodology including the tools and data

sources that may be used in the risk management process weren't established. As a result, the risk plan became weak to ensure that the degree, type, and visibility of risk management that commensurate with the project plan. Therefore, this can be taken as a lesson for GERD to improve its risk planning practices for future projects by involving all stakeholders in the risk planning process and establishing their roles and responsibilities by providing risk management tools and data sources. The main objectives of project risk management is to increase the probability and impact of events that are positive to the project and decrease the probability and impact of events that are negative to the project. Risk planning includes risk identification, qualitative and quantitative risk analysis, and risk response planning, (PMBOK, 2004).

4.4.1 Inputs, Tools and Techniques in risk planning

Table 4.5 Input in risk planning

Input used in risk planning	Responses	
	N	Percent
Project Management Plan	36	40.4
Enterprise Environmental Factors	7	7.9
Project Charter	10	11.2
Organizational Process Assets	8	9.0
Stakeholder Register	28	31.5
Total	89	100.0

Source: Own survey, 2021

Table 4.5 shows that majority of the respondents(40.4%) believed that project management plan was used primarily in risk planning followed by stakeholder register (31.5%) and Project Charter (11.2%).In addition organizational process assets (9%) and enterprise environmental factors (7.9%). In this regard, the interviewee agreed with the questionnaire result except that of the response on organizational Process Assets and enterprise environmental factors. Document analysis by the

researcher also agreed with the interviewee that the project didn't use project charter as input in risk planning. According to PMI (2013), project charter can provide various inputs such as high-level risks, high-level project descriptions, and high-level requirements. In addition, stakeholder register, which contains all details related to the project's stakeholders, provides an overview of their roles.

Table 4.6 Tool and technique in risk planning

Tool and Technique used in risk planning	Responses	
	N	Percent
Analytical Techniques	46	51.7
Expert Judgment	18	20.2
Meetings	25	28.1
Total	89	100.0

Source: Own survey, 2021

According to table 4.6, analytical techniques (51.7%) followed by meetings (28.1%) and expert judgment (20.2%) were used as a tool and technique in risk planning. However, the interview result agreed only with analytical techniques and meetings and refused that the project used expert Judgment. According to PMI (2013), analytical techniques are used to understand and define the overall risk management context of the project. Risk management context is a combination of stakeholder risk attitudes and the strategic risk exposure of a given project based on the overall project context.

In general, the practice of using inputs, tools and techniques as well as incorporating the risk planning activities effectively was poor. Therefore, this becomes a lesson for GERD to improve its risk planning practices in future projects. The RMP should include appropriate definitions, ground rules and assumptions associated with performing risk management on the project, candidate risk categories, suitable risk identification and analysis methodologies, a suitable risk management organizational implementation, and suitable documentation for risk management activities.

4.5 Risk Identification Practice

Table 4.7 Risk Identification Practice

Risk Identification Activities	Likert Scale					Mean	Std. Deviation	
	1	2	3	4	5			
Risks are identified throughout the project lifecycle			-	52.8	47.2	4.47	0.502	89
The project team is involved in the risk identification process.			20.2	40.4	39.3	4.19	0.752	89
Systemic approach is applied for the identification of risk			11.2	50.6	38.2	4.27	0.653	89
A clear description of the risks with the cause and effects are understood and documented.		20.2		37.1	42.7	4.02	1.118	89
Risk register is produced as an output in risk identification process			13.5	38.2	48.3	4.35	0.709	89
Grand mean						4.26		

Source: Own survey, 2021

Table 4.7 depicts that risk identification activities that had been taken place in GERD construction. In this regard, five (5) issues were raised. In the first issue, respondents were asked if risks were identified throughout the project lifecycle, majority of them (100%) were agreed and strongly agreed that risks were identified throughout the project lifecycle. In addition, a mean score obtained in this regard was (4.47). This implies that the practice was good. Similarly, the interviewee result agrees with the questionnaire result.

In the second issue, respondents were asked if the project team were involved in the risk identification process, the result found that 20.2% were neutral but majority of them (79.7%) were agreed and strongly agreed that project team were involved in the risk identification process. In addition, a mean value obtained in this issue was (4.19). This implies that the practice was good. Similarly, the interview result agrees with the questionnaire result.

Regarding the third issue, respondents were asked if systemic approach was applied for the identification of risk, 11.2% were neutral but majority of them (88.8%) were agreed and strongly agreed that systemic approach was applied for the identification of risk. Moreover, the mean value obtained for this issue was (4.27). This implies that the practice is good. Similarly, the result obtained from the interview revealed that the risk identification did follow standard and systematic approach used common risk identification method.

In the fourth issue, respondents were asked if a clear description of the risks with the cause and effects were understood and documented, 20.2% were disagreed but majority of them (79.8%) were agreed and strongly agreed that a clear description of the risks with the cause and effects were understood and documented. In addition, a mean value obtained in this issue was (4.02). This implies that the practice is good. Similarly, the interviewee confirmed that the identified risk gives detail description that guide the project team for effective risk analysis.

The fifth issue also shows the question raised for respondents if risk register was produced as an output in risk identification process, 13.5% were neutral but majority of them (86.5%) were agreed and strongly agreed that risk register was produced as an output in risk identification process. In addition, a mean value obtained in this issue is (4.35). This implies that the practice was good. Similarly, the interview result agreed with the above result.

The grand mean (4.26) and the result obtained from interviewee revealed that project teams were involved in the process of risk identification. In addition, risks were identified throughout the project lifecycle and risk register also be produced in a good manner. In addition the project team follows systemic approach in risk identification and documenting a clear description of the risks with the cause and effects were also inadequate. Therefore, GERD has good risk identification practice by

following systematic approach as well as having a clear description of cause and effects of the risks on the project objectives.

4.5.1 Inputs, Tools and Techniques in Risk Identification

Table 4.8 Input in risk identification

Input used in risk identification	Responses	
	N	Percent
Risk Management Plan	33	37.1
Schedule Management Plan	-	-
Human resource Management Plan	10	11.2
Procurement documents	14	5.7
Organizational Process Assets	-	-
Cost Management Plan	15	16.9
Quality Management Plan	10	11.2
Scope Baseline	-	-
Enterprise Environmental Factors	7	7.9
Total	89	100.0

Source: Own survey, 2021

Table 4.8 shows that majority of the respondents (37.1%) believed that project risk management plan was used primarily in risk identification followed by cost management plan (16.9%) and procurement documents (15.7%). In addition, human resource management plan and quality management plan with each of them (11.2%), enterprise environmental factors (7.9%) but Schedule Management Plan, organizational process assets and scope baseline were not used. Furthermore, the researcher document analysis also shows the same result with the interview.

Table 4.9 Tool and Technique used in risk identification

Tool and Technique used in risk identification	Responses	
	N	Percent
Documentation reviews	15	16.9
Checklist Analysis	8	9.0
SWOT Analysis	20	22.5
Information Gathering Techniques	17	19.1
Assumptions Analysis	13	14.6
Expert Judgment	16	18.0
Total	89	100.0

Source: Own survey, 2021

Table 4.9 depicts that majority of the respondents(22.5%) believed that SWOT analysis followed by information gathering techniques (19.1%), expert judgment (18%), documentation reviews (16.9%), assumptions analysis (14.6%) and Checklist Analysis (9%). According to PMI (2013), a structured review of the project documentation may be performed, including plans, assumptions, previous project files, agreements, and other information. The quality of the plans, as well as consistency between those plans and the project requirements and assumptions, may be indicators of risk in the project. In addition, Risk identification checklists are developed based on historical information and knowledge that has been accumulated from previous similar projects and from other sources of information. Moreover, SWOT analysis identifies any opportunities for the project that arise from organizational strengths, and any threats arising from organizational weaknesses. The analysis also examines the degree to which organizational strengths offset threats, as well as identifying opportunities that may serve to overcome weaknesses.

4.5.2 Risk Categories

Table 4.10 Risk Categories

Risk categories in the project	Responses	
	N	Percent
Internal Risk	15	16.9
Project Specific Risk	50	56.2
External Risk	24	27.0
Total	89	100.0

Source: Own survey, 2021

As shown in table 4.10, majority of the respondents (56.2%) indicated that project specific risks were commonly encountered in the project followed by external risk (27%) and internal risk (16.9%). Similarly, the interviewee also agreed with the questionnaire result.

In general, the practice of using inputs, tools and techniques as well as implementing the risk identification process was good. However, this practice needs further improvement in future projects. Risk identification must continue through all project phases (Kerzner, 2009).

4.6 Qualitative Risk Analysis Practice

Table 4.11 Qualitative Risk Analysis Practice

Qualitative Risk Analysis	Likert Scale					Mean	Std. Deviation	N
	1	2	3	4	5			
Characteristics of the risk are considered before analyzing the identified risk	15.7	13.5	-	28.1	42.7	3.69	1.520	89
Assumptions made during the analysis are stated	-	18.0	11.2	30.3	40.4	3.93	1.116	89
Descriptive terms are used to specify combinations of likelihood and impact	-	-	11.2	53.9	34.8	4.24	0.640	89
Assessments are done by factual information and data where applicable	-	13.5	7.9	46.1	32.6	3.98	0.977	89
Project documents are updated after risks are analyzed	19.1	22.5	-	24.7	33.7	3.31	1.585	89
Grand mean						3.83		

Source: Own survey, 2021

Table 4.11 indicates responses of respondents for questions raised on qualitative risk management process in GERD. Accordingly five (5) issues were raised. In the first issue, the question was that if characteristics of the risk were considered before analyzing the identified risk, 29.2% were disagreed and strongly disagreed but majority of them (70.8%) were agreed and strongly agreed that

characteristics of the risk were considered before analyzing the identified risk. In addition, a mean value obtained in this issue was (3.69). This implies that the practice was good. Similarly, the interviewee result also agreed with the questionnaire result.

In the second issue, respondents were asked if assumptions made during the analysis were stated, 18% were disagreed, 11.2% were neutral but majority of them (70.7%) were agreed and strongly agreed that assumptions made during the analysis were stated. In addition, a mean value obtained in this issue was (3.93). This implies that the practice was good. Similarly, the interviewee result also agreed with the questionnaire result.

Regarding the third issue, respondents were asked if descriptive terms were used to specify combinations of likelihood and impact, 11.2% were neutral but majority of them (88.8%) were agreed and strongly agreed that descriptive terms were used to specify combinations of likelihood and impact. Moreover, the mean value obtained for this issue is (4.24). This implies that the practice was good. Similarly, the interviewee result also agreed with the questionnaire result.

In the fourth issue, respondents were asked if assessments were done by factual information and data where applicable, 13.5% were disagreed, 7.9% were neutral but majority of them (78.6%) were agreed and strongly agreed that assessments were done by factual information and data where applicable. In addition, a mean value obtained in this issue was (3.98). This implies that the practice is good. Similarly, the interviewee explained that there was formal gathering of factual information they use mostly by meetings.

In the fifth issue, respondents were also asked if project documents are updated after risks were analyzed qualitatively, 41.6% were disagreed and strongly disagreed, but majority of them (58.4%) were agreed and strongly agreed that project documents are updated after risks were analyzed qualitatively. In addition, a mean value obtained in this issue was (3.31). This implies that the practice was fair.

The grand mean (3.83) and the result obtained from interviewee confirmed that the characteristics of the risk and assumptions were goodly considered before risks are analyzed qualitatively. In addition, there was fair description of the combinations of likelihood and impact. Therefore, GERD has good qualitative risk analysis practice. Risk analysis is often carried out early in a project when

the information is highly limited within several areas. To manage risks and opportunities effectively, the analysis must be iterated throughout the project as more and more information becomes clear to the management team (Kululanga & Kuotcha, 2010)

4.6.1 Inputs, tools and techniques in Qualitative Risk Analysis

Table 4.12 Input used in qualitative risk analysis

Input used in qualitative risk analysis	Responses	
	N	Percent
Risk Management Plan	29	32.6
Risk Register	25	28.1
Organizational Process Assets	6	6.7
Scope Baseline	9	10.1
Enterprise Environmental Factors	20	22.5
Total	89	100.0

Source: Own survey, 2021

According to table 4.12, majority of the respondents (32.6%) believed that risk management plan were used as input in qualitative risk analysis followed by risk register (28.1%), enterprise environmental factors (22.5%), scope baseline (9%) and organizational process assets (6.7%). Similarly, the result obtained from the interview agreed with the questionnaire result.

Table 4.13 Tool and Technique used in qualitative risk analysis

Tool and Technique in qualitative risk analysis	Responses	
	N	Percent
Risk Probability and Impact Assessment	48	53.9
Expert Judgment	21	23.6
Risk categorization	20	22.5
Total	89	100.0

Source: own survey, 2021

Table 4.13 shows that majority of the respondents (53.9%) believed that risk probability and impact assessment followed by expert judgment (23.6%) and risk categorization (22.5%) were used as a tool and technique in qualitative risk analysis. Similarly, the result obtained from the interview agreed with the questionnaire result.

4.6.2 Risks analysis approach

Table 4.14 Risks analysis approach

Risks analysis approach	Responses	
	N	Percent
Based on probability	39	43.8
Based on accomplishment of the objectives	12	13.5
Based on outcome	10	11.2
Based on financial impact	28	31.5
Total	89	100.0

Source: Own survey, 2021

Table 4.14 depicts that majority of the respondents (43.8%) believed that risk were analyzed based on probability followed by based on financial impact (31.5%), accomplishment of the objectives (13.5%) and outcome (11.2%). However, the interviewee agreed with the questionnaire result.

4.7 Quantitative Risk Analysis Practice

Table 4.15 Quantitative Risk Analysis Practice

Quantitative Risk Analysis	Liker Scale					Mean	Std. Deviation	N
	1	2	3	4	5			
Identified risks are numerically analyzing the effect of on overall project	38.2	29.2	20.2	12.4	-	2.07	1.042	89
An assessment is done for the probability of achieving project	-	19.1	13.5	37.1	30.3	3.79	1.082	89
Identify realistic and achievable cost, schedule and scope targets, given the project risks.	-	22.5	-	34.8	42.7	3.98	1.158	89
Project documents are updated after risks are analyzed	15.7	25.8	14.6	30.3	13.5	3	1.323	89
Grand mean						3.21		

Source: Own survey, 2021

Table 4.15 depicts that results obtained during the assessment of quantitative risk analysis. In this table four (4) issues were raised. In the first issue, respondents were asked if identified risks were numerically analyzing the effect of on overall project objectives, majority of them 67.4% were disagreed and strongly disagreed, neutral were 20.2% and only 12.4% agreed. Moreover, the mean value obtained for this issue was (2.07). This implies that the practice was poor. Likewise, the interviewee also believed that there was no any numerical analysis of risk by how much it affects project objectives.

Regarding the second issue, respondents were asked if an assessment was done for the probability of achieving project objectives, majority of them 67.4% were agreed and strongly agreed, disagreed were 19.1% and also 13.5% neutral. Moreover, the mean value obtained for this issue was (3.79).This implies that the practice was good. Similarly, the interviewee agreed an assessment was done for the probability of achieving project objectives .

In the third issue, respondents were asked if realistic and achievable cost, schedule and scope targets were identified given the project risks, majority of them 77.5% were agreed and strongly agreed, that realistic and achievable cost, schedule and scope targets, were identified given the project risks. The left 22.5% were disagreed. In addition; a mean value obtained in this issue was (3.98). This implies that the practice was good. Similarly, the interviewee explained that the project risk was breakdown in that project objectives could be meeting.

The fourth issue also shows response of respondents while asked if project documents were updated after risks were analyzed quantitatively, 41.5% were disagreed and strongly disagreed, 14.6% were neutral but majority of them 43.8% were agreed and strongly agreed, that project documents were updated after risks were analyzed quantitatively. Moreover, a mean value obtained in this issue was (3). This implies that the practice is fair. Similarly, the result obtained from the interviewee also confirmed that the culture of updating project documents was fair and document analysis by the researcher also revealed the same result.

The grand mean (3.21) and the result obtained from interviewee confirmed that identified were numerically analyzed their effects on overall project objectives. In addition, with the identified project risks, achievable cost, schedule and scope targets were identified realistically. Moreover there was inadequate assessment of the probability of achieving project objectives and also updating of project documents. Therefore, GERD has practice fair quantitative risk analysis in the projects.

4.7.1 Inputs, Tools and Techniques in Quantitative Risk Analysis

Table 4.16 Input used in quantitative risk analysis

	Responses	
	N	Percent
Risk Management Plan	15	16.9
Schedule Management Plan	35	39.3
Enterprise Environmental Factors	9	10.1
Cost Management Plan	14	15.7
Risk Register	9	10.1
Organizational Process Assets	7	7.9
Total	89	100.0

Source: Own survey, 2021

Table 4.16 depicts that majority of the respondents (39.3%) believed that schedule management plan followed by risk management plan (16.9%), cost management plan (15.7%). In addition, enterprise environmental factors and risk register with each (10.1%); organizational process assets (7.9%) were used as input in quantitative risk analysis. However, the interviewee agreed with the questionnaire result of quantitative risk analysis. According to PMI (2013), Perform Quantitative Risk Analysis should be repeated, as needed, as part of the Control Risks process to determine if the overall project risk has been satisfactorily decreased. Trends may indicate the need for more or less focus on appropriate risk management activities.

Table 4.17 Tool and Technique in quantitative risk analysis

	Responses	
Tool and Technique used in quantitative risk analysis	N	Percent
Data Gathering and Representation Techniques	18	20.2
Quantitative Risk Analysis and Modeling Techniques	44	49.4
Expert Judgment	27	30.3
Total	89	100.0

Source: Own survey, 2021

Table 4.17 depicts that majority of the respondents (49.4%) believed that quantitative risk analysis and modeling techniques followed by expert judgment (30.3%) and data gathering and representation technique (20.2%) were used as tools and technique in quantitative risk analysis. According to PMI (2013), Continuous probability distributions, which are used extensively in modeling and simulation, represent the uncertainty in values such as durations of schedule activities and costs of project components. Discrete distributions can be used to represent uncertain events, such as the outcome of a test or a possible scenario in a decision tree. In addition, Sensitivity analysis helps to determine which risks have the most potential impact on the project. It helps to understand how the variations in project's objectives correlate with variations in different uncertainties. Moreover, Expected monetary value (EMV) analysis is a statistical concept that calculates the average outcome when the future includes scenarios that may or may not happen (i.e., analysis under uncertainty). The EMV of opportunities are generally expressed as positive values, while those of threats are expressed as negative values.

4.8 Risk Response Practice

Table 4.18 Risk Response Practice

Risk Response Activities	Likert Scale					Mean	Std. Deviation	N
	1	2	3	4	5			
A strategy is developed in order to prevent or mitigate all the identified risks	19.1	43.8	-	23.6	13.5	2.69	1.378	89
Options and actions are developed to enhance opportunities and to reduce threats to project objectives	18.0	29.2	-	24.7	28.1	3.16	1.544	89
The most appropriate treatment option is prepared that balance the costs of implementing each option against the benefits derived from	18.0	34.8	-	27.0	20.2	2.97	1.473	89
Risks are addressed by their priority	10.1	16.9	11.2	33.7	28.1	3.53	1.332	89
Project management plan, project documents and organizational process assets are updated after risk response process	-	27.0	-	40.4	32.6	3.79	1.172	89
Grand mean						3.23		

Source: Own survey, 2021

In table 4.18, five (5) issues were raised to assess the risk response for identified and analyzed risks.

In the first issue, respondents were asked if a strategy was developed in order to prevent or mitigate all the identified risks, 37.1% were agreed and strongly agreed that a strategy was developed in order to prevent or mitigate all the identified risks, however majority of them 62.9% were disagreed and

strongly disagreed. In addition, a mean value obtained in this issue was (2.69). This implies that the practice is fair. Similarly, the result obtained from the interview and document analysis by a researcher revealed that the project didn't strategically develop risk response for the identified risks. The process follows standard and formality.

In the second issue, respondents were asked if options and actions were developed to enhance opportunities and to reduce threats to project objectives 47.2% were disagreed and strongly disagreed but majority of them (52.8%) were agreed and strongly agreed that options and actions were developed to enhance opportunities and to reduce threats to project objectives. In addition, a mean value obtained in this issue was (3.16). This implies that the practice is fair. Similarly, the interviewee explained that the project team was only focus prioritizing the potential risk severity and seriousness of negative impact with cost and benefit analysis.

Regarding the third issue, respondents were asked if the most appropriate treatment option was prepared that balance the costs of implementing each option against the benefits derived from, 47.2% were agreed and strongly agreed but majority of them 52.8% were disagreed and strongly disagreed that the most appropriate treatment option was prepared that balance the costs of implementing each option against the benefits derived from. Moreover, the mean value obtained for this issue was (2.97). This implies that the practice was fair. Likewise, the interviewee also stated that there wasn't appropriate treatment prepared to balance the costs of response options.

In the fourth issue, respondents were asked if risks were addressed by their priority, 27% were disagreed and strongly disagreed, 11.2% were neutral but majority of them 61.8% were agreed and strongly agreed that risks were addressed by their priority. In addition, a mean value obtained in this issue was (3.53). This implies that the practice is good. Similarly, the interviewee result also agrees with the questionnaire result.

In the fifth issue, respondents were also asked if project management plan, project documents and organizational process assets were updated after risk response process, 27% were disagreed but majority of them (73%) were agreed and strongly agreed that project management plan, project documents and organizational process assets were updated after risk response process. In addition, a

mean value obtained in this issue was (3.79). This implies that the practice is good. Similarly, the interviewee result also agrees with the questionnaire result. The grand mean (3.23) and the result obtained from interviewee revealed that a well-developed. Strategy had been prepared that balance the costs of implementing each option against the benefits and prevent or mitigate all the identified risks. In addition, the project did consider business opportunity to reduce threats to project objectives. Moreover, risks were treated by their priority and project documents also be updated adequately.

A response strategy can be to eliminate the probability or impact of a risk, or to accept the risk and calculate with a potential extra cost if the risk occurs (Kululanga & Kuotcha, 2010).The risk response is then based on the combined value of each risk, which leads to a risk management where the response is in relation to the magnitude of the risk (Briner, Hastings, & Geddes, 1996).

4.8.1 Inputs, tools and techniques in Risk Response

Table 4.19 Input used in risk response

Input in risk response	Responses	
	N	Percent
Risk Management Plan	21	23.6
Risk Register	68	76.4
Total	89	100.0

Source: Own survey, 2021

Table 4.19 depicts that majority of the respondents (76.4%) believed that risk register followed by risk management plan (23.6%) were used as input in risk response. Similarly, the interviewee also agreed with the questionnaire result.

Table 4.20 Tool & Technique used in risk response

Tool & Technique used in risk response	Responses	
	N	Percent
Strategies for Negative risks or Threats	9	10.1
Strategies for Positive Risks or Opportunities	37	41.6
Expert Judgment	20	22.5
Contingent Response Strategies	23	25.8
Total	89	100.0

Source: Own survey, 2021

According to table 4.20, majority of the respondents (41.6%) believed that strategies for positive risks or opportunities followed by Contingent Response Strategies (25.8%), Expert Judgment (22.5%) and Strategies for Negative risks or Threats (10.1%) were used as a tool and technique in risk response. However, the interviewee agreed with the response on expert judgment and Contingent Response Strategies but disagreed with the rest responses. According to PMI (2013), the exploit strategy under strategies for positive risks or opportunities may be selected for risks with positive impacts where the organization wishes to ensure that the opportunity is realized. This strategy seeks to eliminate the uncertainty associated with a particular upside risk by ensuring the opportunity definitely happens. In addition, the enhance strategy is used to increase the probability and/or the positive impacts of an opportunity. Identifying and maximizing key drivers of these positive-impact risks may increase the probability of their occurrence. Moreover, sharing a positive risk involves allocating some or all of the ownership of the opportunity to a third party who is best able to capture the opportunity for the benefit of the project.

4.8.2 Risk response option

Table 4.21 Risk response option

Risk response option	Responses	
	N	Percent
Avoid	8	9
Transfer	30	33.7
Mitigate	40	44.9
Accept	11	12.4
Total	89	100.0

Source: Own survey, 2021

Table 4.21 depicts that majority of the respondents (44.9%) believed that mitigate followed by transfer (33.7%), accept (12.4%) and avoid 9%were used as a risk response option in the project. According to PMI (2013), Risk transference is a risk response strategy whereby the project team shifts the impact of a threat to a third party, together with ownership of the response. Transferring the risk simply gives another party responsibility for its management, it does not eliminate it. Transferring does not mean disowning the risk by transferring it to a later project or another person without his or her knowledge or agreement. Risk transference nearly always involves payment of a risk premium to the party taking on the risk. Transferring liability for risk is most effective in dealing with financial risk exposure.

4.9 Risk Monitoring and Control Practice

Table 4.22 Risk Monitoring and Control Practice

Risk Monitoring and Control Activities	Likert Scale					Mean	Std. Deviation	N
	1	2	3	4	5			
Risks that occur within the project are controlled in a way that goes with the goal and objective of the project.	-	18.0	6.7	42.7	32.6	3.90	1.056	89
Identified risks are tracked	-	-	19.1	44.9	36.0	4.17	0.727	89
Residual risks are monitored	-	27.0	18.0	32.6	22.5	3.51	1.119	89
New risks are identified	29.2	24.7	-	38.2	7.9	2.71	1.432	89
Effectiveness of risk management process is evaluated throughout the project	-	16.9	-	40.4	42.7	4.09	1.051	89
Risk monitoring and control is treated as a continuous process in the project	-	-	-	51.7	48.3	4.48	0.503	89
Project management plan, project documents and organizational process assets are updated after monitoring and control process	-	23.6	9.0	29.2	38.2	3.82	1.183	89
Grand mean						3.81		

Source: Own survey, 2021

Table 4.22 shows result obtained from response of respondents in risk monitoring and control process. In this regard, seven (7) issues were raised. In the first issue, respondents were asked if risks that occur within the project were controlled in a way that goes with the goal and objective of the project, 18% were disagreed, 6.7% were neutral but majority of them (75.3%) were agreed and strongly agreed that risks that occur within the project were controlled in a way that goes with the goal and objective of the project. In addition, a mean value obtained in this issue was (3.90). This implies that the practice was good. Similarly, the interviewee confirmed that the project team committee were able to control the identified risks within the schedule and allocated budget.

Regarding the second issue, respondents were asked if identified risks were tracked, 19.1% were neutral but majority of them (80.9%) were agreed and strongly agreed that identified risks were tracked. Moreover, the mean value obtained for this issue was (4.17). This implies that the practice was good. Similarly, the interviewee result also agreed with the questionnaire result.

In the third issue, respondents were asked if residual risks were monitored, 27% were disagreed, 18% were neutral but majority of them (55.1%) were agreed and strongly agreed that risks were addressed by their priority. In addition, a mean value obtained in this issue was (3.51). This implies that the practice is good. Similarly, the interviewee stated that aware of residual risks that the project team identified during the project life cycle.

In the fourth issue, respondents were asked if new risks were identified, 46.1% were agreed and strongly agreed but majority of them (53.9%) were disagreed and strongly disagreed that new risks were identified. In addition, a mean value obtained in this issue was (2.71). This implies that the practice was fair. Similarly, the interviewee agreed that the project team committee were liable to identify the risks together with the project team.

Regarding the fifth issue, respondents were asked if effectiveness of risk management process was evaluated throughout the project, 16.9% were disagreed but majority of them (83.1%) were agreed and strongly agreed that effectiveness of risk management process was evaluated throughout the project. Moreover, the mean value obtained for this issue was (4.09). This implies that the practice is good. Similarly, the interviewee agreed that the project team had risk management knowledge to

evaluate the effectiveness of the risk management process.

Regarding the sixth issue, respondents were asked if risk monitoring and control was treated as a continuous process in the project, 100% were agreed and strongly agreed that risk monitoring and control was treated as a continuous process in the project. Moreover, the mean value obtained for this issue was (4.48). This implies that the practice was very good. Similarly, the interviewee stated that with questioner results.

In the seventh issue, respondents were also asked if project management plan, project documents and organizational process assets were updated after monitoring and control process, 23.6% were disagreed, 9% were neutral but majority of them (67.4%) were agreed and strongly agreed that project management plan, project documents and organizational process assets were updated after monitoring and control process. In addition, a mean value obtained in this issue was (3.82). This implies that the practice is good. Similarly, the interviewee agreed that the culture of updating and documentation good.

The grand mean (3.81) and the result obtained from interviewee revealed that monitoring of risks, identification of new risks and tracking of risks were performed in a good manner. While, the practice of controlling of project risks was fair in a way that goes with the goal and objective of the project. On the contrary, evaluating effectiveness of risk management process was good. In addition, updating project management plan, project documents and organizational process assets were seen as good practice in the project. Therefore, GERD is performed monitor but also controlling the risks that goes with the goal and objective of the project and evaluate the effectiveness of risk management process. According to Kerzner (2009), Risk monitoring and control is not a problem-solving technique but, rather a proactive technique to obtain objective information on the progress to date in reducing risks to acceptable levels.

4.9.1 Inputs, tools and techniques in risk monitoring and Control

Table 4.23 Input used in risk monitoring and control

Input used in risk monitoring and control	Responses	
	N	Percent
Project Management Plan	7	7.9
Work Performance Data	40	44.9
Risk Register	8	9.0
Work Performance Reports	34	38.2
Total	89	100.0

Source: Own survey, 2021

According to table 4.23, majority of the respondents (44.9%) believed that work performance data followed by work performance reports (38.2%), risk register (9%) and project management plan (7.9%) were used as input in risk monitoring and control in the project. Similarly the result obtained from the interview agreed with the questionnaire result.

Table 4.24 Tool & Technique used in risk monitoring and control

Tool & Technique used in risk monitoring and control	Responses	
	N	Percent
Risk Reassessment	9	10.1
Risk Audit	35	39.3
Reserve Analysis	5	5.6
Variance and Trend Analysis	26	29.2
Technical Performance Measurement	8	9.0
Meetings	6	6.7
Total	89	100.0

Source: Own survey, 2021

According to table 4.24, majority of the respondents(39.3%) believed that risk audit was the main tool and technique used in risk monitoring and control followed by Variance and Trend Analysis(29.2%), risk reassessment(10.1%), technical performance measurement(9%), meetings (6.7%) and Reserve Analysis (5.6%) were used as a tool and technique in risk monitoring and control. According to PMI (2013), control Risks often results in identification of new risks, reassessment of current risks, and the closing of risks that are outdated. Project risk reassessments should be regularly scheduled. The amount and detail of repetition that are appropriate depends on how the project progresses relative to its objectives. Risk audits examine and document the effectiveness of risk responses in dealing with identified risks and their root causes, as well as the effectiveness of the risk management process. For the purposes of controlling risks, trends in the project's execution should be reviewed using performance information. Earned value analysis and other methods of project variance and trend analysis may be used for monitoring overall project performance. Outcomes from these analyses may forecast potential deviation of the project at completion from cost and schedule targets. Deviation from the baseline plan may indicate the potential impact of threats or opportunities. In addition, technical performance measurement compares technical accomplishments during project execution to the schedule of technical achievement. It requires the definition of objective, quantifiable measures of technical performance, which can be used to compare actual results against targets. Throughout execution of the project, some risks may occur with positive or negative impacts on budget or schedule contingency reserves. Reserve analysis compares the amount of the contingency reserves remaining to the amount of risk remaining at any time in the project in order to determine if the remaining reserve is adequate.

In general, the practice of using inputs, tools and techniques as well as implementation of the risk monitoring and control was fair. However, these practices need further improvement in future projects. According to Kerzner (2009), the key to the risk monitoring and control process is to establish a cost, technical performance, and schedule management indicator system. The indicator system should be designed to provide early warning of potential problems to allow management actions.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The major purpose of the study was to assess project risk management practices in GERD construction. In this regard, the practice of risk planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response, monitoring and control of risk were seen in the assessment by raising different issues in the form of questionnaire and interview.

According to the response obtained from majority of the respondents revealed that project team didn't have deep experience in risk management. In addition, there was no documented risk register from previous projects that support the project team in risk identification and analysis. Moreover, the organization policy and procedure was inadequate to guide the project team to go through a disciplined risk management process. As a result, the project teams were unable to link analysis of threats and opportunities and analysis of project risk strongly.

The result obtained in risk planning confirmed that all stakeholders weren't participated in risk planning. In addition, the roles and responsibilities of the various stakeholders participating in the risk management weren't clearly established. Moreover, the risk management methodology including the tools and data sources that may be used in the risk management process weren't established efficiently. As a result, the risk plan had limitation to ensure the degree, type and visibility of risk management that commensurate with the project plan.

Regarding risk identification, systematic approach was applied and also the description of the risks with the cause and effect adequate clarity. In addition, schedule management plan, organizational process assets and scope baseline weren't used as input and document review, checklist analysis, SWOT analysis, information gathering techniques, assumptions analysis and expert judgment as a tool in risk identification. Moreover, project specific risks were commonly encountered in the project followed by external risk and internal risk. According to response of majority of the respondents in qualitative risk analysis revealed that assessments were done by factual information and risk analysis performed based on probability followed by based on financial impact , accomplishment of the objectives and outcome descriptive form and accurate

assumption using environmental factors and planned risk management. In addition, project documents were be updated after risks were analyzed qualitatively. Moreover, the practice of risk response was primarily mitigated followed by transfer, accept and accept.

In quantitative risk analysis, no input and tools were used. As a result, identified risks were analyzed numerically its effect on the overall project objectives and financial impact. In addition, realistic achievable cost, schedule and scope targets were identified with the given project risk. Moreover, project documents were updated after risks were analyzed quantitatively.

In risk response, strategies for positive risks or opportunities followed by contingent response strategies, expert judgment and Strategies for Negative risks or Threats were used as a tool and technique in risk response. As a result, not limitation had been seen in developing a strategy and enhances an opportunity to prevent or mitigate all the identified risks. In addition, project document plan, project documents and organizational process assets were updated.

The result obtained from the assessment of risk monitoring and control practice revealed that that risk audit was the main tool and technique used in risk monitoring and control followed by Variance and Trend Analysis, risk reassessment, technical performance measurement, meetings and Reserve Analysis were used as a tool and technique in risk monitoring and control. In addition, there was a good in evaluating the effectiveness of risk management process throughout the project. The risk monitoring and control process also needs continuity. As a result, risks that occur within the project were controlled in the way that goes with the goal and objective of the project. Moreover, project management plan, project documents and organizational process assets were updated.

Furthermore, important inputs, tools and techniques were used effectively used during the process of risk planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response, risk monitoring and control.

5.2 Conclusion

The general objective of the study was to assess project risk management practices of GERD construction. In this regard, the study specifically assessed the practice of risk planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response, monitoring and control. Accordingly, the following conclusions have been made.

Regarding the process of risk planning, the project used project management plan, enterprise environmental factor, project charter, organizational process assets and stakeholder register as input and analytical techniques, meetings and expert judgment as a technique. In addition, all stakeholders weren't participated and the roles and responsibilities of the project teams weren't clearly stated in the risk plan. As a result, the risk plan had weakness to ensure the degree, type, and visibility of risk management that commensurate with the project plan. As a result, the practice of risk planning was categorized as poor.

In the process of risk identification, the project used risk management plan, enterprise environmental factors, human resource management Plan, cost management plan, quality management plan, and procurement document as input and SWOT analysis, expert judgment, information gathering, assumptions analysis, documentation reviews, and checklist analysis techniques as techniques. In risk identification project teams did follow systemic approach in risk identification even though they were involved in the identification of risks throughout the project lifecycle. Moreover, project specific risks were commonly encountered in the project followed by external risk and internal risks. Thus, in this regard, the practice of risk identification was good.

Regarding the process of qualitative risk analysis, the project used risk management plan, risk register, enterprise environmental factors, scope baseline, and organizational process assets as input and also impact assessment, expert judgment, and risk categorization as techniques. However, the practice of incorporating factual information and updating project documents was good even though it considered assumptions before risks were analyzed qualitatively and the combinations of likelihood and impact also be described goodly. Thus, in this regard, the practice of qualitative risk analysis was good.

In the process of quantitative risk analysis, project risks weren't analyzed identified risks are numerically analyzing the effect of on overall project objectives. However, there was adequate assessment of the probability of achieving project objectives and also updating of project documents. Moreover, there were input, tools and techniques used in quantitative risk analysis. Such as risk management plan, enterprise environmental factors, schedule management plan, cost management plan, risk register and organizational process assets as input and expert judgment, modeling technique, data gathering and representation technique as technique were applicable. Thus, the practice of quantitative risk analysis was good.

Regarding the process of risk response, the project used risk register and risk management plan as input and strategies for positive risks or opportunities, contingent response strategies, expert judgment, and strategies for negative risks or threats as techniques. In addition, there have a well-developed strategy had been prepared that balance the costs of implementing each option against the benefits and prevent or mitigate all the identified risks even though mitigation followed by transfer, accept and avoid were used as risk response option in the project. Moreover, the risk response was based on priority of risks. Thus, the practice of risk response planning was good.

In the process of risk monitoring and control, the project used work performance data; work performance reports, project management plan and risk register as input and risk audit, variance and trend analysis, risk reassessment, technical performance measurement, meetings and reserve analysis as technique. Consequently, risks could be controlled effectively that goes with the goal and objective of the project. In addition, effectiveness of risk management process was evaluated. Moreover, project management plan, project documents and organizational process assets were updated appropriately even though risks were monitored, not new risks were identified and risks were tracked in a good manner. Thus, in this regard, the practice of risk monitoring and control was good.

Furthermore, the organization's risk policy and procedure was insufficient for project risk management. In addition, the project teams had lack of adequate experience in risk management, Moreover, project teams weren't motivated and unable to get documented risk register from previous projects that help them to go through a disciplined risk management process. Hence, the practice of project risk management became poor. Therefore, GERD

construction has to amend its risk management practices for future projects.

5.3 Recommendation

Based on the study finding there are some recommendations. These are important to improve the project risk management practice of GERD.

- Proper emphasis should be given to create a good understanding and enhanced technical knowledge regarding risk and risk management practices within the employees' of GERD. In addition GERD should prepare appropriate training and development programs related to risk and risk management for its employees.
- Training and development have to be given for project team in project risk management particularly using tools and techniques in risk planning, risk identification, risk analysis, risk response, monitoring and control.
- The risk procedure has to be prepared clearly and specifically for projects that guide the project team to go through a disciplined risk management process.
- All project stakeholders should participate in the risk planning.
- The roles and responsibilities of various stakeholders participating in the project should be clearly mentioned and documented.
- For effective project risk management; relevant inputs, tools and techniques should be applied in the process of risk planning (inputs such as project charter, enterprise environmental factors, and organizational process assets), risk identification (inputs such as schedule management plan , organizational process assets and scope baseline & tools and techniques such as checklist analysis, and assumption analysis).
- The risk management plan should be prepared with detail requirement gathering.
- The risk management plan should have strong linkage with analysis of threats and opportunities and analysis of project risk.
- An increase in the use of risk management techniques may lead to improved profitability, reduced costs, and better time management.

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Appendix I:

Research budget and Time plan

Budgeting

The tentative amount required to carry out the proposed study is presented below:-

	Description	Rate	Total
1	Research materials	lump sum	2,000.00
2	Stationary and Printing	lump sum	1,000.00
3	Internet	lump sum	700.00
4	Logistic	500*90(days)	1,000.00
5	Thesis printing	lump sum	500.00
	Total		5,200.00

Time Table

The proposed research program will schedule for six months. Detail research schedule presented in the table below.

	time / work	1st month	2nd month	3rd month	4th month	5th month	6th month
1	literature review and desk study						
2	field work and data collection						
3	data interpretation						
4	dissertation writing and defense						

Appendix II:

Questionnaire

ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

PROJECT MANAGEMET DEPARTMENT

Dear Participants

First of all I would like to appreciate those who are willing to participate in this research. I am Mulugeta Geremew, an MA graduate student in Project Management at St. Mary's University School of Graduate. The main purpose of the questionnaire and interview is to collect data for the research entitled "**Assessing the practices of construction project risk management in grand Ethiopia renaissance dam (GERD)**".

This is an academic research and the information you provide will be treated strictly confidential. Therefore, I kindly request you to complete the questionnaire with honesty and genuinely.

If you have any questions please contact:

Mulugeta Geremew

Mobile:+251 910874340

Email: mgeremew42@gmail.com

General Instruction:

- Part I contains questions on demographic information. Please respond by putting a tick (✓) in boxes or write the answer in the space provided (if any other).

- Part II contains questions on Project Risk Management Process. Please indicate your perceived risk management practice by putting a tick (✓) at the corresponding column from strongly agree to strongly disagree (i.e. Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, strongly Disagree=1). In addition, Please put a tick (✓) to one or more of your choice for other multiple choice questions
- Part III contains interview questions
- Please attempt all questions

Part I: Demographic Information

1. Age:

21-30 years ☐ 31-40 years ☐ 41-50 Years ☐ Above 50 Years ☐

2. Educational Background:

Bachelor Degree ☐ Masters ☐ PhD ☐ Other, please specify,_____

4. Work Experience in projects?

Below 1 Year ☐ 1-2 Years ☐ 2-3Years ☐ more than 3 Years ☐

5. Do you have any formal risk management training?

Yes ☐ No ☐

Part II: Project Risk Management Process

A. General Project Risk Management Practice

S/No.	Questions	Strongly Disagree(1)	Disagree(2)	Neutral(3)	Agree(4)	Strongly Agree(5)
1	There is a specific department/Work unit responsible for project risk management practices?					
2	Project team have deep project experience in risk management					
3	There is documented risk register from previous projects that support project team in risk identification and analysis					
4	Risks are identified during work break down structure(WBS)					
5	There is a policy and procedure that guide the project team to go through a disciplined risk management process					
6	Project teams are motivated in the process of project risk management					

B. Risk Planning

S/No.	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7	The risk management plan has obtained agreement and support from all stakeholders					
8	The risk plan ensures that the degree, type, and visibility of risk management that commensurate with the project plan					
9	the risk management methodology including the tools and data sources that may be used in the risk management process are established					
10	the roles and responsibilities of the various project stakeholders participating in the risk management is clearly established					

11. What input is used in risk planning?

a. Project Management plan ☐ d. Organizational Process Assets ☐

b. Enterprise environmental Factors ☐ e. Stakeholder Register ☐

c. Project Charter ☐

12. What tool and technique is used in risk planning?

a. Analytical Techniques ☐ b. Expert Judgment ☐ c. Meetings ☐

C. Risk Identification

S/No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
13	Risks are identified throughout the project lifecycle					
14	The project team is involved in the risk Identification process.					
15	Systemic approach is applied for the identification of risk					
16	A clear description of the risks with the Cause and effects are understood and documented.					
17	Risk register is produced as an output in risk identification process					

18. Risk categories that the project usually encounters:

a. Internal risk ☐

b. Project specific risk ☐

c. External risk ☐

19. What input is used in risk identification?

a. Risk Management plan ☐ f. organizational Process Assets ☐

b. Schedule Management plan ☐ g. cost Management Plan ☐

c. Human resource Management Plan ☐ h, Quality Management Plan ☐

d. Procurement documents ☐ i. Enterprise Environmental Factors ☐

e. Scope Baseline ☐

20. What tool and technique is used in risk identification?

a. Documentation reviews ☐ d. Information Gathering techniques ☐

b. Checklist Analysis ☐ e. Assumptions Analysis ☐

c. SWOT Analysis ☐ f. Expert Judgment ☐

D. Risk Analysis

D.1 Qualitative Risk Analysis

S/No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21	Characteristics of the risk are considered before analyzing the identified risk.					
22	Assumptions made during the analysis are stated					
23	Descriptive terms are used to specify combinations of likelihood and impact					
24	Assessments are done by factual information and data where applicable					
25	Project documents are updated after risks are analyzed qualitatively					

26. What input is used in qualitative risk analysis?

a. Risk Management Plan ☐ d. Scope Baseline ☐

b. risk register ☐ e. Enterprise Environmental Factors ☐

c. organizational Process Assets ☐

27. What tool and technique is used in qualitative risk analysis?

a. Risk Probability and Impact Assessment ☐ c. risk categorization ☐

b. Expert Judgment ☐

28. Risks are analyzed based on:

a. Probability ☐ c. Outcome ☐ d. financial impact ☐

b. accomplishment of the objectives ☐

D.2 Quantitative Risk Analysis

S/No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
29	identified risks are numerically analyzing the effect of on overall project objectives					
30	An assessment is done for the probability of achieving project objectives					
31	Identify realistic and achievable cost, Schedule and scope targets, given the project risks.					
32	Project documents are updated after risks are analyzed quantitatively					

33. What input is used in quantitative risk analysis?

a. Risk management plan ☐ d. cost Management plan ☐

b. Schedule management plan ☐ e. risk register ☐

c. Enterprise Environmental factors ☐ f. organizational Process Assets ☐

34. What tool and technique is used in quantitative risk analysis?

a. Data Gathering and representation techniques ☐

b. Quantitative risk Analysis and Modeling techniques ☐

c. Expert Judgment ☐

E. Risk Response

S/No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
35	A strategy is developed in order to prevent or mitigate all the identified risks					
36	Options and actions are developed to enhance opportunities and to reduce threats to project objectives					
37	The most appropriate treatment option is prepared that balance the costs of implementing each option against the benefits derived from					
38	Risks are addressed by their priority,					
39	Project management plan, project documents and organizational process assets are updated after risk response process					

40. What input is used in risk response?

a. Risk Management Plan ☐ b. risk register ☐

41. What tool & technique is used in risk response?

a. Strategies for negative risks or threats ☐

b. Strategies for positive risks or opportunities ☐

c. Expert judgment ☐

d. Contingent response strategies ☐

42. What risk response option is used in the project?

a. Avoid ☐ b. Transfer ☐ c. Mitigate ☐ d. Accept ☐

F. Risk Monitoring and Control

S/No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
43	Risks that occur within the project are Controlled in a way that goes with the goal and objective of the					
44	Identified risks are tracked					
45	residual risks are monitored					
46	new risks are identified					
47	effectiveness of risk management process is evaluated throughout the project					
48	Risk monitoring and control is treated as a continuous process in the project					
49	Project management plan, project documents and organizational process assets are updated after monitoring and control process					

50. What input is used in risk monitoring and control?

a. Project Management Plan ☐ c. Risk Register ☐

b. Work Performance Data ☐ d. Work Performance Report ☐

51. What tool and technique is used in risk monitoring and control?

a. Risk Reassessment ☐ e. Technical Performance Measurement ☐

b. Risk Audit ☐ f. Meetings ☐

c. Reserve Analysis ☐

d. Variance and Trend Analysis ☐

Part III Interview

1. Is there a policy and procedure that guide the project team to go through a disciplined risk management process? If yes, how it supports the project team in risk management?

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_____
_____

2. Do project teams get training in risk management? If yes, how it helps in risk management activities?_____
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_____
_____

3. Does the project have risk management plan? If yes, does it have a strong linkage with the project
plan?_____
_____
_____
_____

4. Are the roles and responsibilities of the project team assigned for risk management?

_____
_____
_____

5. Does the project follow standard risk management process (i.e. risk planning, risk identification, Qualitative & Quantitative risk analysis, Risk response, monitoring and control)?

_____
_____

6. Is there any reward that motivates project teams to develop effective risk management system?

_____
_____

7. Do GERD and its projects have a risk register? (a document in which the results of risk analysis and risk response planning are recorded) If yes, what information is available in the risk register and who is responsible for preparing the document?
_____
_____

8. Are project stakeholders participated in the risk planning process of the project? If yes what input they have in the process?

_____
_____
_____

9. Are risks categorized? If yes, which types of risk appear in the project?

_____
_____
_____

10. How risk identification process is performed in the project? What inputs are used? What tools and techniques are used?

_____
_____
_____

11. How qualitative risk analysis process is performed in the project? What inputs are used?

What tools and techniques are used?

_____
_____
_____

12. How quantitative risk analysis process is performed in the project? What inputs are used?

What tools and techniques are used?

_____
_____
_____

13. How risk response process is performed in the project? What inputs are? What tools and techniques are used? What risk response option is applied in the project?

_____
_____
_____

14. How monitoring and control process is performed in the project? What inputs are used? What tools and techniques are used? Is monitoring and control a continuous process?_____
_____
_____