ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Assessment on risk management practice on project of water supply constructions: a case of Addis Ababa water supply and sewerage authority (AWSSA)

BY

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Ethiopia

Declaration

I, Meraf Abuye Yilma, declare that this project work entitled "Assessment on risk management practice on project of water supply constructions in the case of Addis Ababa water supply and sewerage authority (AWSSA) is my original work and has not been submitted to ST. Mary University or any other higher learning institution as a project work and all sources of information have been duly acknowledged.

I have carried out the project work in fulfilment of the requirement for the award of masters of arts degree in project management, independently under the supervision of the research advisor, Ato yilikal Wassie.

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BY

MERAF ABUYE

A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN PROJECT MANAGEMENT.

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Assessment On Risk Management Practice on Project of Water Supply Constructions: A Case of Addis Ababa Water Supply and Sewerage Authority (AWSSA).

BY

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ENDORSEMENT

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

_____ _____

Advisor Signature

St. Mary's University Addis Ababa **June 2023**

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ABSTRACT

The thesis aims to contribute to the improvement of water supply construction projects in Addis Ababa by providing recommendations for enhancing risk management practices. By doing so, the study hopes to ensure the success, safety, and reliability of future water supply construction projects undertaken by AAWSA. Descriptive survey research design was used in this study. Primary source of data was collected through questionaries and interview. Secondary source of data was gathered from various research works and documents of the organization. The total population size of the study was 370. These questionnaires were distributed to the respondents and returned and filled appropriately. Simple random sampling techniques were used for the questionnaire where as a case study approach were used to assess risk management practice of water supply projects. The researcher used a semi-structured questionnaire. SPSS- version 20 is used to organize and analyze the data captured from the respondents. Descriptive statistics was used to explain the current knowledge practices in the organization. The researcher use correlational analysis, standard deviation and frequency distribution.

The findings of the study were, the risk management procedures and policies of the organization were insufficient. The project teams also lacked the necessary risk management experience, weren't motivated, and couldn't access the recorded risk register from earlier projects that would have enabled them to follow a structured risk management procedure. As a result, project risk management became poorly practiced. For future projects, Addis Ababa Water Supply and Sewerage Authority (AWSSA) must modify its risk management procedures.

Finally, the researcher tries to recommend, such as, all project stakeholders should participate in the risk planning, Training and development have to be given for project team in project risk management, for effective project risk management; relevant inputs, tools and techniques should be applied in the process of risk planning.

***Key words**: Risk, Project Risk Management, Addis Ababa water supply and sewerage authority (AWSSA)*

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Acronyms

AWSSA: Addis Ababa Water and Sewerage Authority

APM: Association for Project Management

PMBOK: Project Management Body of Knowledge

PMI: Project Management Institute

PRM: Project Risk management

RMP: Risk Management Plan

SWOT: Strengths, Weaknesses, Opportunities, and Threats

PMBOK: Project Management Body of Knowledge

PRM: Project Risk Management Practices

WHO: World Health Organization

ERM: Enterprise Risk Management

ITIL: Information Technology Infrastructure Library

WASH: Water, Sanitation and Hygiene

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

According to PMI (2008) project risk is an uncertain event that when it occurs leads to a positive or negative consequence on at least one project objective, such as cost, time, quality or scope. Risk management is one of the nine knowledge areas propagated by the PMI. Project Management Body of Knowledge (PMBOK,2004) highlighted the essence of risk management as it includes the processes concerned with carrying out risk management in areas of initiating, planning, identifying, analyzing and monitoring and controlling on a project. Project risk management discipline has developed over a period of time as critical part of project management. Risk can have a two-dimensional meaning, either a negative implication or appositive implication.

Risk management practices involve identification, understanding and determining of the potential unsatisfactory results that is likely to affect a project (Muriana & Vizzini, 2017). After identifying the uncertainties, the risks involved are then analyzed basedon likelihood and impact of the risks. According to Burtonshaw (2017), tools used in risk examination include the use of probability (Risk matrices), the SWOT analysis which is analyzing the strength, weakness, opportunity, and threat associated with the risk that has emerged.

After the SWOT analysis the top ten risk item tracking technique is applied to access and rank the risk depending on the significance to a particular project. Probability and impact can be prioritized using a five-point scale for evaluating risk in the scale of critical risk, serious risk, moderate risk, minor risk and negligible risk. According to the PMBOK (2004) Risk control and response includes avoidance, acceptance, transfer and mitigation and thereafter positive risk can be enhanced, shared and exploited.

According to Cagliano, Grimaldi and Rafele (2015) risks should be continuously evaluated and monitored in order to identify new risks and effectiveness of risk control and feedback. Carvalho, and Rabechini (2015) identifies five Project Risk Management Practices (PRM) they include;

systematic risk identification through documentation of reviews and information gathering techniques like SWOT analysis and interviews; methodic trade-off analysis which involves coming up with a plan and appointing risk manager; detailed planning for uncertainty to reduce the probability and the consequences associated with an adverse risk to an acceptable threshold; probabilistic risk analysis which includes assessing of likelihood that a risk will occur and the effects if it occurs. A critical component of management of risk is the mitigating risk at its point of occurrence by reducing their impact. A successful risk mitigating strategy often leads to a reduction in the adverse impacts.

According to Chapman and Ward (2007), when a risk mitigation strategy is well planned and properly administered it replaces an uncertain even with a more controlled and predictable response. Control activities at the planning phase includes risk profiling, architect and engineer selection process, architect and engineer contract review, site selection and validation, need identification and validation and preliminary budget and schedule development Wallace and Blumkin (2007).

According to the International Organization for Standardization (ISO) risk is an effect of uncertainty on objectives, which means that they either results to a positive or negative effect.

ISO 31000 is a set of standards relating to management of risks codified by the ISO 31000:2009, Risk management – Principles and guidelines it provides a principle, framework and a process for risk management. It can be applied by any organization regardless of its capacity, operations or sector. Using ISO 31000 helps organizations to increase the likelihood of achieving its vision, mission and objectives, improve the 6 identification of opportunities and threats and effectively allocates and utilizes resources for risk treatment.

Risk management is according to Project Management Institute (PMI) one of the nine knowledge areas and the integration of an effective risk management is considered a crucial element and essential for project success. Construction projects can be described as tremendously complex projects in which uncertainty might arise from various sources. Risk management is there for increasingly becoming an extensive component of the project management of construction projects in a pursuit to efficiently deal with unexpected events and ambivalence. It is important due to the damaging consequences imposed by risk and uncertainty (Banaitene and A. Banaitis, 2012). However, for years the industry has had a poor reputation for

managing the adverse effects of change resulting in delays and a failure to meet quality and cost targets (Smith et al., 2006).

The objective of an efficient risk management procedure is to facilitate risk neutral decision making, which in turn will result in superior performance. Systematic methods for obtaining more information about uncertainty on the project is needed to achieve that objective (Winch, 2010). the implementation of various techniques and methods for risk management- and assessment will however not remove all risks but the aim is to ensure that the risks are assessed and managed in a manner allowing the overall objectives of the project to be achieved (Potts, 2008).

Risk management involves the establishment of risk consciousness, integration of basic principles of risk policy and organizational integration. This allows, through proactive action, the project to be prepared for unavoidable problems and an increased transparency (Schieg, 2006). It is an ongoing process throughout the entire the project life cycle as risks will continually change. Risk management is the process of identifying, assessing and responding to risk and it is important to work as an integrated project team from the earliest possible phases, in order to identify and efficiently deal with risks when they arise (Potts, 2008).

The benefits of the process are clearer understanding of the specific risks associated with a project, supported decisions by detailed analysis and a buildup of historical data that can be used to assist future risk management procedures. Unfortunately, many project managers have still not realized the importance of implementing project risk as an integral part of the delivery of a project (Smith et al., 2006).

An inefficient implementation of risk management is often caused by the lack of formalized procedures, the lack of continuity in the different project phases and an inadequate integration of knowledge management and interaction between processes and parties.

During the construction process the major responsibility to deal with risks is laid upon contractors by deciding if the risks should be reduced, avoided, transferred or retained (Liu et al., 2007). In order to manage risk effectively the contractor needs to understand risk responsibilities, risk management capabilities and event conditions (Banaitene and A. Banaitis, 2012).

The purpose of this study was to assess risk management practice of water supply construction projects in order to identify major gaps and recommend the best and upper proposed project risk management methods.

1.2 Statement of the Problem

Projects are always subject to uncertainty and risk, and if the associated risks are not properly managed, it can lead to project failure in the form of delayed completion (Jean, 2015). Globally, regionally and locally various studies have been conducted on the risk management practices on performance and success of projects.

For instance, Carvalho and Rabechini (2015) investigated the impact of project risk management practices on success of IT projects findings of the study revealed that IT projects carry out risk management to maximize the performance and to manage risk effectively and efficiently enjoy financial savings and greater productivity.

Adeleke, Nasidi and Bamgbade (2016) assessed the influence of risk management practices of construction projects in Lagos findings of the study revealed that risk management practices have a positive correlation with project success. When used consistently, risk management practices increase the chances of project success.

Ogolla and Mburu examined the effect of risk management practices on performance of SME dealing with communication and technology in Nairobi Kenya findings of the study revealed that many (ICT) enterprises in Nairobi, Kenya have realized the importance of risk management practice in ICT project management to achieve process success and adoption of risk management practices has improved success rates of new projects and better decision making.

Macharia (2017) investigated risk management strategies and performance of public-school construction projects in Murang'a county findings of the study revealed that the risk avoidance strategy has the strongest influence on performance of construction projects while risk transfer had the lowest influence risk management strategies have positive influence on performance of construction project in secondary schools.

The above-mentioned studies have proved that risk management practices enhance project performance. There is a contextual gap since very few studies have been done on the influence of risk management practices on project of waters supply constructions in case of Addis Ababa water supply and sewerage authorities.

project is one of the riskiest as compared to other projects because of the complexity in coordinating various activities. The core element of project success is to meet the time, cost, and quality as targeted. In order to achieve these targets, risk may appear in many ways and could

result in time overrun, budget overrun, financial losses, loss of life, environmental damage, and many more failures.

Therefore, project can be positively success by considering the risks where it normally tends to give positive and negative effect on the project. Lack of systematic project risk management downgrades efficiency, value, time and also adversely affects the overall project performance which in turn increases expense of construction projects.

Countrywide, risk management is a relatively new discipline, therefore, although construction project failure is a common practice, risk management consideration is not given priority and it is not recognized as a solution for the project failures.

However, it has been proved that investment in risk management actually minimizes the chance of failure by identifying and analyzing risks, and improving the project management process and effective use of resources.

Effective risk management practices are essential for ensuring that water supply construction projects are completed on time, within budget, and to the required quality standards. This is especially important in the case of AAWSA, which is responsible for providing water and sanitation services to the residents of Addis Ababa, the capital city of Ethiopia.

The assessment of risk management practices in water supply construction projects at AAWSA is particularly relevant given the challenges and risks associated with such projects, including issues related to financing, project management, technical complexity, and environmental impact.

By conducting a comprehensive assessment of risk management practices at AAWSA, researchers can identify areas for improvement and develop recommendations for enhancing the effectiveness of these practices. This could include identifying best practices for risk identification, assessment, and mitigation, as well as developing strategies for improving communication and collaboration among project stakeholders.

Overall, the assessment of risk management practices in water supply construction projects at AAWSA is an important area of research that has the potential to improve the success and sustainability of water supply projects in the region, ultimately benefiting the residents of Addis Ababa.

1.3 Objectives of the study

1.3.1 General objective

The General objective of this study is to Assess on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA).

1.3.2 Specific Objectives

The specific objectives of the study include the following:

- To investigate the practice of project risk identification practice on the project of waters supply constructions in case of AWSSA.
- To inspect project risk response strategy practice on the project of waters supply constructions in case of AWSSA.
- To identify the practice of risk analysis on the project of waters supply constructions in case of AWSSA.
- To assess project risk monitoring and controlling practice on project of waters supply constructions in case of AWSSA.

1.4 Research questions

- What is the practice of project risk identification practice on the project of waters supply constructions in case of AWSSA?
- What is the project risk response strategy practice on the project of waters supply constructions in case of AWSSA?
- What are the practices of risk analysis on the project of waters supply constructions in case of AWSSA?
- What are the project risk monitoring and controlling practice on project of waters supply constructions in case of AWSSA?

1.5 Significance of the study

Conducting an assessment on project risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA) has both theoretical and practical significance.

Theoretically***:*** Unlike the availability of several literatures on project risk management, the available literature and previous studies which provide detailed information regarding risk management practice in waters supply constructions are very few. Hence, undertaking this study is expected to contribute to the advancement of the existing theoretical coverage on project risk management practice of waters supply constructions. Also, the finding and conclusion of this study can lead to the initiation of further study by anyone who might be interested in the topic.

Practically*:* the study has the potential to have significant value for many companies especially for those who want to engage in high waters supply constructions. If such companies employ unorganized and inappropriate risk management, they could face a multiple problem in their project performance such as: time overrun, budget overrun, financial losses, loss of life, environmental damage, and many more failures.

Therefore, the findings of this assessment can provide the opportunity, for construction companies, to understand the essence of the modern risk management practice and its effect on project efficiency. Finally, after completing the study and analyzing the results, proper recommendations will be reported to the concerned bodies of the case study of Addis Ababa water supply and sewerage author's (AWSSA).

In this study the researchers get knowledge about the study and experience for conducting another research. To other researchers: conductive effective research on training and development program and serves as a stepping stone for other researchers.

1.6 Scope of the Study

Researchers on the study was constrained at Addis Ababa water supply and sewerage author's (AWSSA) for the purpose of doing research easily for academically year 2015/2023. Researchers was delimited to study Assessment on risk management practice on project of waters supply constructions only for simplicity doing our research to achieve the research objective. Conceptually, the researcher assessed the Assessment on risk management practice

on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). Methodologically, the study delaminated to descriptive study research design; quantitative research approach was used for data collection and analysis. To assess risk management practice on project of waters supply constructions Simple random sampling was used for group homogeneity. Geographically, risk management practice on project of waters supply constructions was taken as an area for this study because of its convenience for the researcher to collect data easily. Regarding the time scope, the study was conducted for academically for the year 2015/2023.

1.7 Limitation of the study

The limitations faced by the researcher while conducting the study were: -

- The research addressed only water supply construction projects that constructed by AWSSA due to limited time. It was difficult to collect sufficient data and gave more empirical results and the finding of the result may not represent as a general representation in the water supply construction industry.
- Access to key stakeholders within AAWSA, such as project managers, engineers, and contractors, was limited, it impacts the accuracy and completeness of the data collected.
- Time constraints were faced that limit the amount of data that can be collected or analyzed, the depth and quality of the analysis.

1.8 Organization of the report

This research report is divided into five chapters, the first of which contains an introduction, the history of the study and project, a statement of the problem, the relevance of the investigation, the research objectives and questions, and the scope and constraints of the study. A survey of the pertinent literature makes up Chapter 2. To provide the groundwork for the study and to develop the theoretical, conceptual, and empirical frameworks, a variety of literatures were studied. The processes used to collect and evaluate the data from which conclusions were made are described in full in chapter three, along with the study methodology. The analysis of the data obtained using the tools and procedures for data collection mentioned in the methodology section is presented in chapter four.

The topics of summary, conclusion, and suggestion are covered in Chapter 5. The references used in the study are listed at the end. The questionnaires used are also included in the Appendix part.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter, the risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA) will be analyzed. Different literature reviews and the sources of literature books, texts, journals, magazines, periodicals newspapers, reports of the regulatory body, the internet, and other media sources, previous research works, and observations related to the subject under consideration. These will help to clarify and strengthen the research work and present the findings in an organized manner.

2.2 Conceptual reviews

2.2.1 The concept of Project Risk

Project risk is an uncertain event or set of circumstances that, should it occur, will have an effect on the achievement of the project's objectives. That is inability to precisely determine what will happen in the future, as future is full of uncertain. And every decision we make or action we take contains some element of risks (APM, 2006). Risk is not only related to a specific point of actions, but it also relates to future project conditions. Conditions can change during project life cycle and may turn out to be favorable or unfavorable. In the early stage of a project, there is a high degree of uncertainty, which decreases when we have a high degree of background knowledge (Flanagan R & Norman G, 1995).

Such uncertainties or events may influence accomplishment of project goals in terms of schedule, cost, quality, safety, security, and environment (Fang C et al., 2012). Many authors agree that project risk has both positive and negative effects on project objectives (Adedokun et al., 2013) and (Wang S.Q et al., 2004). (Perry J.G. & Hayes R.W., 1985) defined risk as an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective.

However, others said risk is closely connected to uncertainty and is a commonly used term in all kinds of contexts, but is often related to the negative outcome of a certain event (Hamzaoui F. et

al., 2015). And this negative outcome result in losses, which are generally referred to as project risks (Webb, 1994) and (Chapman C., 2003). It is the measure of the probability, severity and the exposure to all hazards of an activity (Sarkar D. & Panchal.S., 2015). (Jaafari, 2001) define risk as the exposure to loss, gain, or the probability of occurrence of loss/gain multiplied by its respective magnitude.

(Kartam N. & Kartam S., 2001) defines risk as the probability of occurrence of some uncertain unpredictable and even undesirable events that would change prospects for the probability on a given investment. Risks may be defined as uncertainties resulting in an adverse outcome, adverse planned objectives, or expectations (Kumar, Chatterjee, Chandrasekhar & Patwardhan, 2005). Risk refers to a condition where there is a possibility of undesirable occurrence of a particular result, which is known or best quantifiable and therefore insurable, " (Periasamy, 2008).

The risk may mean that there is a possibility of loss or damage, which, may or may not be happen. The risk may be defined as the possibility of loss in the simplest words. It may be a financial loss or loss to the reputation/ image (Sharma, 2003). A risk can be defined as an unplanned event with financial consequences resulting in loss or reduced earnings (Vasavada, Kumar, Rao & Pai, 2005). An activity, which may give profits or result in loss, may be called a risky proposition due to uncertainty or unpredictability of the activity of the trade-in future. In other words, it can be defined as the uncertainty of the outcome.

Although the terms risk and uncertainty are often used synonymously, there is a difference between the two (Sharma, 2003). Uncertainty is the case when the decision-maker knows all the possible outcomes of a particular act but does not have an idea of the probabilities of the outcomes. On the contrary, the risk is related to a situation in which the decision-maker knows the probabilities of the various outcomes. In short, the risk is a quantifiable uncertainty.

In general, the risk is all about uncertainty. That is the inability to precisely determine what will occur in the future, as the future is full of uncertainty. About what is a risk Osborne (2012) has claimed that what we all are talking about is a future problem- or, indeed, opportunity or the potential future effect of a decision or an action that we take now. And every decision we make or action we take contains some element of risk.

Furthermore, Osborne (2012) has indicated that, "Risks can arise as a result of our business's activities or as a result of external factors such as legislation, market forces, interest or exchange rate fluctuations, the activities of others, or even the weather. They can be a product of the

business environment, the natural environment, and the political or economic climate or of human inadequacies, failures, or errors. The bottom line is that risk may impact on our ability to meet our business objectives or even threaten the business itself."

The types and the degree of effect of risk defers among business organizations, even within industry level as they might differ in their size, complexity of the task, types of service or product being offered, or organizational structure. Thus, risks that business organizations face are inherent to their operations or endeavours.

As to the classification of risk Jorion and Khoury's (1996) argument cited by Khan and Ahmed (2001) discusses that there are different ways in which risks are classified. One way is to distinguish between business risks and financial risks. Business risk arises from the nature of a firm's business. It relates to factors affecting the product market. Financial risk arises from possible losses in financial markets due to movements in financial variables (Jorion and Khoury 1996). It is usually associated with leverage with the risk that obligations and liabilities cannot be met with current assets (Gleason 2000).

Another way of decomposing risk is between systematic and unsystematic components. While systematic risk is associated with the overall market or the economy, unsystematic risk is linked to a specific asset or firm. While the asset-specific unsystematic risk can be mitigated in a large diversified portfolio, the systematic risk is non-diversifiable. Parts of systematic risk, however, can be reduced through risk mitigation and transferring techniques.

2.2.2 Project Risk Management

Numerous authors have defined project risk management in different way. Risk management is a systematic approach to setting the best course of action under uncertainty by identifying, assessing understanding, acting on and communicating risk issues (Berg, 2010). Risk management in a project encompasses identifying influencing factors that could potentially negatively impact a project's cost schedule or quality baselines; quantifying the associated potential impact of the identified risk; and implementing measures to manage and mitigate the potential impact. The riskier the activity is, the costlier the consequences if the wrong decision is made (Mills, 2001).

Risk management is not a separate project office activity assigned to a risk management department, but rather is one aspect of sound project management. Risk management should be

closely coupled with key project processes, including but not limited to: overall project management, systems engineering, cost, scope, quality, and schedule (Kerzner, 2009) .

The amount of project risk management can vary based on attributes such as risk tolerance, resources, and organization maturity along with specific project attributes. Any amount of project risk management can be a benefit to a project, although balance needs to be used to avoid wasting time and energy on excessive or costly activities that provide only diminishing returns (Marchetti, 2012).

2.2.3 Project Risk Management Practice

The operating environment should comprise the integrity and competence of colleagues, management's philosophy and operating style, and the way management communicates and delegates responsibility, and develops its people. The components of the risk management environment are risk governance, risk culture, risk oversight, risk appetite and tolerance, and the three lines of defense.

a) Risk Governance- A waters supply constructions should have a strategy that involves a determination of project objectives, the risk appetite, the organizational approach to risk management, and the approach to operational risk management. The strategy also involves setting up an operational risk policy statement describing the overall approach and can be made specific to each construction line as applicable. Risk governance is an integral aspect of corporate governance that focuses on the structures, processes, and approaches to the management of the significant risks to the firms' objectives.

The overall risk management system should comprehensively be embodying all departments/sections of the institution to create a risk management culture (Habib, 2011). There should be clearly defined accountabilities and expectations for all relevant parties, including the roles and responsibilities of the Board of management, and employees; clearly defined policy for the management of all significant risks; the rules and process for risk-based decision making; a sound system for internal control, and an appropriate assurance process.

b) Risk oversight- The project leaders should oversee senior management to ensure that policies, processes, and systems are implemented effectively at all decision levels. The team leaders are responsible for outlining the overall risk appetite, objectives, and strategies of risk management for any building institutions. The overall risk objectives should be communicated

throughout the institution. Other than approving the overall policies of the construction regarding risk, the project team should ensure that the management takes the necessary actions to identify, measure, monitor, and control these risks. The project leader should periodically be informed and review the status of the different risks the water supply construction projects are facing through reports.

c) Risk appetite and tolerance- Within the framework of risk culture, appropriate risk appetite is recognized and the governance makes sure that no risks are taken beyond what the culture and appetite can handle (Nazanin and Kateryna, 2015). Therefore, there should be a risk appetite and tolerance statement for operational risk that articulates the nature, types, and levels of operational risk that the project is willing to assume (BCBS, 2011).

d) The three lines of defense- One common governance model is the "three lines of defense (3LoD)" model. According to Doughty (2011), strategic implementation of the 3LoD is the first principle of the risk governance framework for providing effective operational risk management. The consists of three levels as follows:

The first line includes business frontline personnel. Their main task is to understand their roles and responsibilities and to perform these correctly and fully on a day-to-day basis (Doughty, 2011). In addition, in the first line, employees need to apply internal controls to treat the risk associated with their tasks. Besides the frontline employees, the risk management committee monitors and builds the department's day-to-day risk environment (Doughty, 2011).

The second line consists of supervision functions which include compliance and risk control. The responsibilities of these line employees include participating in the business unit risk committees, reviewing risk reports, and validating compliance to the risk management control requirements (Doughty, 2011).

Lastly, the third line consists of internal auditors who independently and objectively take the role of consultants and add value to the organization. They help the organization to achieve its goals by bringing in a systematic approach that provides effective risk management and control procedures to the business (KPMG, 2009). There is a higher level of independence in this line compared to the second line.

2.2.4 Risk Management Process and System

To overcome the risk and to make waters supply constructions function well, there is a need to manage all kinds of risks associated with the waters supply constructions. Risk management

becomes one of the main functions of any projects and consists of identifying the risk and controlling them, which means keeping the risk at an acceptable level. These levels differ from institution to institution and country to country. The basic objective of risk management is to stakeholders; value by maximizing the profit and minimizing the risk of inability for the attainment of the objective of the waters supply constructions organization. The risk management system outlined here can be a standard for waters supply constructions to follow.

There is no single management system that would fit all waters supply constructions. Therefore, project leaders require each single project to develop its comprehensive risk management system fitted to its need and circumstances.

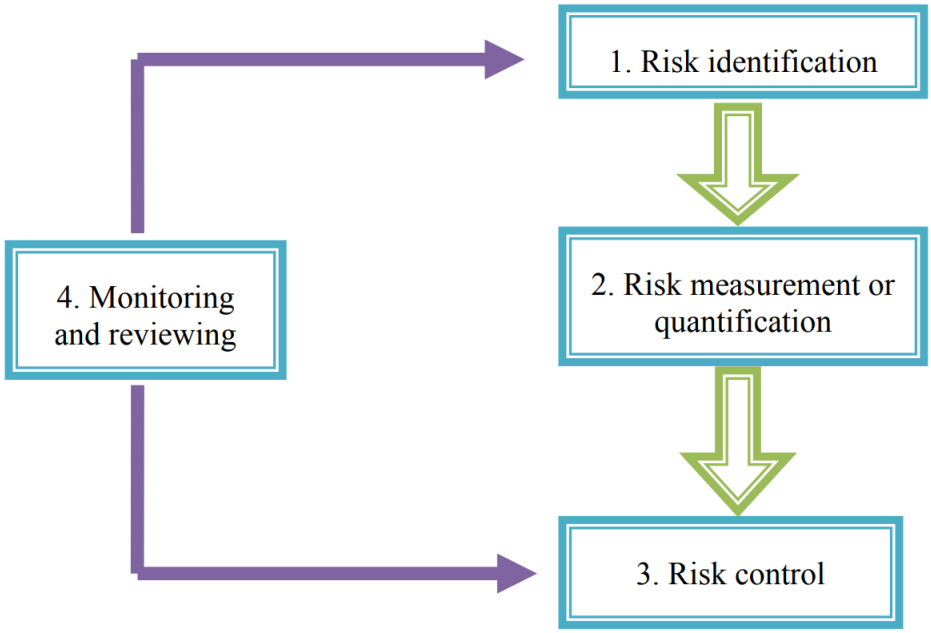

Figure 2 : Risk Management Process

2.2.4.1 Risk Identification

Before taking any meaningful action to address our risk, risks must first be identified. Almost every single step of the construction phase has a unique risk profile composed of multiple risks. So, risk identification process should be understood at both the initial and middle construction levels. 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, 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 project's 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) discuss 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 Skit more 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). In short, risk identification involves, Understanding the nature of various kinds of risks, Circumstances that lead a situation to become a risk situation and by which the risk could arise.

2.2.4.2 Risk Measurement or Quantification

Risk quantification is an assessment of the degree of the risk, to which a particular transaction or an activity is exposed to. Though the exact measurement of risk is not possible the level of risk can be determined with the help of risk rating models. Accurate and timely measurement of risk is essential to an effective risk management system. 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).

2.2.4.3 Risk Control

After risk identification and measurement banks should control or minimize risks. As to many scholars, there are three ways to control risks or at least minimize their adverse consequences: Avoiding or placing limits on certain activities/risks, Mitigating risks and Offsetting risks. To do the above activities, waters supply constructions take steps to control the risk with the help of various tools such as diversification of the business, insurance, prevarication, and fixation of exposure ceiling, transfer of the risk to another party at the right time and securitization and reconstruction.

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 an example of potential opportunity arising from risk

2.2.4.4 Risk Monitoring & Reviewing

Keeping close track of risk identification measurement activities in the light of the risk, principles, and policies is a core function of a risk management system. For the success of the system, the operating wings must perform their activities within the broad contours of the organization's risk perception as Ashan & Poonam (2013).

In risk monitoring, the waters supply constructions have to fix up the parameters on which the transaction is to be tested to be sure that there is no risk to the viable existence of the financial unit or investment of the waters supply constructions. 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)

Though main elements of risk management include identifying, measuring, monitoring, and managing various risk exposures these cannot be effectively implemented unless there is a broader process and system in place.

The overall risk management process should comprehensively embody all departments/sections of the institution to create a risk management culture. It should be pointed out that the specific risk management process of individual financial institutions depends on the nature of activities and the size and sophistication of an institution. The risk management system outlined here can be a standard for waters supply constructions to follow. A comprehensive risk management system should encompass the following four components (Jorion 2001).

2.2.5 Type of risk response

According to (Kerzner, 2009), the response strategies, which typically deal with threats or risks that may have negative impacts on project objectives if they occur, are: avoid, transfer, and mitigate. The responses that are suggested to deal with risks with potentially positive impacts on project objectives are to exploit, share, enhance, and accept.

(PMI, 2013), further elaborates that type of risk responses mainly based on whether the risk is positive (opportunity) or it is negative (threat), It differentiates risk responses in the following manner;

Response for negative risks (threat)

- ✓ Avoid: to completely eliminate the risk's probability or impact to zero. such as restructuring the projects activity, scope, schedule, or cost to eradicate the root causes leading to the risk. (PMI, 2013), also states that risk avoidance: is a strategy for negative risks or threats that involves changing the project plan to eliminate the risk or to protect the project objectives (time, cost, scope, quality) from its impact. This can be achieved through activities including using suitable procurement option, change the method of execution and etc.
- ✓ Mitigate: If risk cannot be avoided, actions might be taken to reduce the risk's probability or its impact if it does occur. Mitigation may have the effect of reducing probability and impact (Fewings, 2005). According to (Cooper, 2005), mitigation strategies include: Contingency planning, Quality assurance, Separation or relocation of activities and resources, Contract terms and conditions and Crisis management and disaster recovery plans.
- ✓ Transfer: assigns all or part of risks to third party through outsourcing, contract, insurance, warranties, guarantees or performance clauses.

Response for positive risks (opportunities)

- ✓ Exploit: to ensure that the risk event definitely occurs so that it's benefits can be realized.
- ✓ Enhance: If action cannot be taken to guarantee that the opportunity will occur then response might be taken to enhance its probability or its beneficial impact if it does occur.

- ✓ Share: share opportunity to third party who is best able to capitalize on it. 22 Response for negative and positive risks
- ✓ Accept: is an option for risks with low probability, low impact, or those that have no reasonable action that can be taken.
- ✓ Contingent: involves a contingency plan, which will be put into effect should the risk response fail.

2.2.6 Project Risk Management in waters supply Construction Projects

Risk management has become a necessary requirement for construction projects. Risk matrix was used as basis for numerous countries. There are numerous factors that lead to slow construction progress of the contracting process (Doloi, Sawhney, Iyer, & Rentala, 2012; Gündüz, Nielsen, & Özdemir, 2012; Marzouk & El-Rasas, 2014; McCord, McCord, Davis Haran, & Rodgers, 2015; Bagaya & Song,2016).

A profound example of this is the Murali et al. through analyzing reasons that cause delay of construction industry in Malaysia (Sambasivan & Soon, 2007). The author presented the 10 most important causes of delay from a list of 28 different causes and 6 different effects of delay. In addition, Doloi et al. (2012) identified the key factors impacting delays in the Indian construction industry. It established the relationship between the critical attributes for developing prediction models for assessing the impacts of these factors on delays using questionnaires and personal interviews (Doloi, Sawhney, Iyer, & Rentala, 2012).

Regarding the projects, despite its schedule delay, it is also influenced by a variety of factors that are different from various countries; previous researches have improperly focused on this topic. For instance, Wang et al. (2012) through evidence from Chinese construction companies, have quantitatively investigated the cause-effect relations among partnering, design management, and project outcomes which concluded that design management is critical to project performances (Wang, Tang, Qi, Shen, & Huang, 2015).

However, the research does not show mutual interactions amongst design, procurement, and construction risks. Shi et al. (2014) also presented a comprehensive assessment of investment risks for overseas power projects by establishing risk assessment model (Ge & Shi, 2014). Therefore, Wang et al. (2012) have presented 22 risk elements grouped into five groups including environment, technology, finance, and management to assess indicators of risks

(Wang, Liu, & Zhu, 2012). Liu et al. (2010) attempted the Carlo method to deal with random variables in order to manage financial risks, compensation, and financial management in construction process (Liu & Song, 2010).

However, detailed and accurate assessment of risks influencing projects is dependent on characteristics and developing level of a specific country. Assessment of the impact of risks is a complex problem, which must be approached systematically by breaking down the task into four stages that are risk classification, risk identification, risk analysis and risk response (Abd, 2015).

Efficient risk management is of the principal importance to water utilities. Three attributes are crucial to water users which that must be adequate quantities of water on demand, must be delivered at sufficient pressure and must be safe to use. Access to a reliable supply of drinking water and safe water quality are basic requirements of human health and economic development. In the third edition of the guidelines for drinking- Health Organization (WHO), it is pointed out that a comprehensive risk management approach is the most effective way to ensure the safety of drinking water supply. Chan et al. (2014) identified and evaluated typical risks related to Public Private Partnership projects in the Chinese water supply sector.

The discoveries displayed that completion risk, inflation, and price change risk have a higher impact on Chinese water public-private partnership projects. Roozbahani et al. (2013) studied risk assessment from tap to source of urban water supply systems that was usually subjected to a multiplicity of undefined threatening hazards.

These threats differed to three main groups of natural, human-made, and operational hazards, which influence water quantity or water quality. Tchórzews- ka-Cieślak (2011) applied a fuzzy logic-based method for risk assessment of drinking water system by defining the fuzzy rules between likelihood of pipe failures, consequence of failure, and sensitivity of water mains, drinking water technical system is an essential element of urban infrastructure.

Wibowo and Mohamed (2010) investigated risk critically and allocation in privatized water supply projects in Indonesia and discussed the perception of regulator and operator in the term of project risk critically and allocation and both regarded to the principal concerned which was non-availability of raw water.

In order to evaluate the reliability of water supply systems under threatening conditions, risk assessment recognized as a useful tool to identify the hazard, analyse vulnerabilities, and risks.

Therefore, the present paper aims to indicate most critical and significant risk factors that have a great influence on water supply projects. In addition, it aims to identify and assess risks during the construction of water supply projects and ratings of risk factors.

Construction projects can be extremely complex and fraught with uncertainty. Risk and uncertainty are inherent in all construction work no matter what the size of the project (Carr V. & Tah J.H.M., 2001). Risks and uncertainties appear in various shapes; besides, no construction project is risk free (Haimes, 2015). The complexity of a project leads to the existence of a network of interdependent risks (Fang C. & Marle F. , 2012), where complex phenomena may occur, hard to anticipate and hard to keep under control (Fang C. & Marle F. , 2013).

Construction projects are initiated in complex and dynamic environments resulting in circumstances of high uncertainty and risk (Adedokun et al., 2013), (Hamzaoui F. et al., 2015) ; and (Zhen-Yu Z. & Lin-Ling D. , July 27-31 ,2008). Unexpected risk involves the threat of uncontrollable, unpredictable and unanticipated events, which are especially considered by the management of large-scale projects, since these unexpected risk events (Hamzaoui F. et al., 2015).

Risk management in the construction project management context involves identification, assessment and prioritization of risks by monitoring, controlling, and applying managerial resources with a coordinated and economical effort so as to minimize the probability and/or impact of unfortunate events and so as to maximize the realization of project objectives (Dauglas, 2009).

An effective use of project management techniques such as risk management is considered as key supporting processes and to add to them quality, cost, time and change control (Al-Shibly H et al., 2013).

Construction projects are always unique and risks raise from a number of the different Sources (Oyegoke, 2006). There are different causes of risks in construction such as size, organizational and technical complexities, speed of construction, location of the project, technology being used and familiarity with the work (Dey P.& Ogunlana S., 2004).

In addition to the organizational and technical complexities, project managers have to consider a growing number of parameters (e.g., environmental, social, safety and security) and stakeholders, both inside and outside the project.

Risk and uncertainty can potentially have damaging consequences for the construction projects (Flanagan R et al., 2006). Project risk has a significant impact on a construction project's performance in terms of cost, time and quality (Kululanga G. & Kuotcha W., 2010). Accordingly, (Tsegaye, 2009) many construction projects fail to achieve their time, budget and quality goals. These risks have a direct influence on project success. Many projects tend to exhibit cost overruns and schedule delays (Koushki et al., 2005)

Moreover, the consequences of risk in construction industries of developing countries, including sub-Saharan region are more severe than in established Western Construction industries (Wang S.Q et al., 2004). The rapid growth of the Ethiopian economy calls for massive development of infrastructures and assets. While this brings opportunities to project stakeholders, employing effective risk management method to cope with risks associated with variable construction activities is of importance to implement the projects aligning with project objectives including time, cost, quality, safety and environmental sustainability (Andualem, 2019).

2.3 Theoretical Review

Kothari (2003) the theoretical review provides the researcher with an opportunity to have a philosophical stand. Theoretical framework affects the decisions made in the process of research. The study was guided by three theories namely; Network Theory, Expectancy Theory and lastly the Enterprise Risk Management Theory.

2.3.1 Expectancy Theory

This theory was developed by Vroom (1964). The theorist believes that motivation of the individual is determined by perception of relationship between the actions and rewards. The theory is categorized into three sections namely, valence, expectancy and instrumentality.

Expectancy assumes that a certain level of effort will be followed with certain level of performance. Valence represents a value that a given outcome has for individual. Instrumentality relates to the connection between first level outcome like promotion and second level outcome such as raise.

Thomas (1990) analyzed Vroom expectancy theory model in the context of construction industry, and found that the theory discusses variations of performance in terms of effort which the employee is willing to exert in order to finish a job. According to Thomas, the result

performance could be observed based on efficiency, effectiveness, quality of work, innovation, profitability and productivity.

According to Gonzalez (1991), managers should determine the outcome of each employee values and define adequate and good performance, in terms that are observable and measurable so that employees understand managers' desires. Project managers in construction industries should also ensure that intended level of performance is attainable in fact; they should connect the outcome required by the workers to specific performance. This theory relates to performance of projects as it will help all stakeholders such as projects managers to develop measurement guide that can give important feedback to workers therefore improving performance of projects.

2.3.2 Enterprise Risk Management Theory

According to Nocco and Stulz (2006), Enterprise Risk Management (ERM) is a risk management theory advocates for recommends for the measurement and management of notable risk facing a given entity whole than the management of each risk independently. Its main aim is to combine the risk management silos in an organization into one holistic and comprehensive framework.

The ERM risk management framework of managing risk emphasizes that senior company executives and employees should actively be involved in risk management process of analyzing and responding to a wide range of company risks (Hallowell, Molenaar, &Fortunato, 2013).

This concept encourages all members of the organization to be involved in the management of risks and not only one or a few members. The ERM also highlight the importance of clear process and policies for managing risks.

According to Olson and Wu (2010), the theory also affirms that if 10 organizations can embrace formal policies that define risks appetite, strategic goals, tolerance and systematic processes then they can improve their risk management capacity of identifying, analyzing, and treating of risks. The theory also stresses on a creation of risk management culture where all stakeholders are empowered and accountable to manage risks. Cormican (2015) suggested that ERM practices involve increased competitive advantage, stakeholder confidence and long-term viability of organizations.

The ERM theory has become popular in project management techniques despite the fact that it was developed for management of company risks. Drumll (2001) explains that adopting ERM philosophy in the construction industry is a wise decision as it applies to industries that have very

high rates of failure like construction industry. These failures are as a result of failure to identify, mitigate and control risk across the entire business making this theory relevant to this research

2.3.3 Network Theory

Network theory is a hypothesis that is used to clarify the structure and working of social frameworks. According to Fang, Marle, Zio&Bocquet (2015) this hypothesis sees social frameworks, for example, organizations or projects as a network that includes nodes and links associating these nodes.

For example, in a given projects, the nodes may incorporate members of the project team, the task administrator, suppliers, owner of the project and project financiers. These nodes are associated with different connections such as supplier buyer relationship, financing, legal, and working connections. The hypothesis clarifies that adjustments or unsettling influences in any node or line inside the system cause a progressively outstretching influence on every single other line and nodes. The theory is frequently used as a part of risk management to clarify and educate the procedure of risk analysis.

Moreover, according to Zingrand (2010), this theory also put more emphasis on the need to adopt a systematic approach when analyzing and understanding risk instead of concentrating on the risk consequences as one component of the project. It urges project team to consider how different segments of the project are interrelated and how obstruction in one component will influence other components of the project.

This point of view of investigating risk empowers managers of the project to think of a more reasonable and all-encompassing evaluation of the effect of specific risk. This theory recommends that in order to judge the success of project management strategies the researcher should establish the extent at which this strategy holistic and comprehensive making this theory relevant to this research.

2.4 Empirical Literature Review

This part discusses different researchers that were undertaken on the practice of project risk management in Ethiopia and most of them found that project risk management was poorly practiced.

A study by (Getnet, 2019) on assessment of Project Risk Management Practices: The case of Commercial Bank of Ethiopia information technology infrastructure library (ITIL) Project

discovered that risk management plan was not included in the project management plan. Therefore, there was no any formal policy that guides the project team to overcome uncertainties in the project. There was also no defined risk roles and responsibility. Hence, project team had no enough experience in project risk management so that they are not capable to come up with uncertainties.

As a result, risks were mainly handed by project manager and the consultant since there was no responsible department for risk handling. Moreover, all inherent project risks were not identified and risk register was not developed. Besides, identified risks were not numerically analyzed on the overall objectives of the project and project documents were not updated after risks were analyzed. Risk response planning to enhance opportunities and to reduce threats to project objectives was poor. In addition, risks were not audited and reviewed periodically, and risk management was not evaluated throughout project lifecycle.

In (Manalebih, 2018) study conducted on assessing the practice of project risk management: The Case of World Vision Ethiopia Water, Sanitation and Hygiene (WASH) Projects, project risk management practice of the project under study was fairly good as compared to previous similar studies on project risk practices in Ethiopia. The strength of the project to handle its project risk should be taken as best experience for similar projects.

In his study, the author revealed that there was well developed risk management plan that was prepared with the involvement of all project stake holders and with the availability of good and systematic risk management practice. The study also revealed that risk identification and risk assessment were the most often used risk management elements ahead of risk response and risk documentation. And the primary method used by the project to identify risk is document review based on previous projects. Check list and information gathering were also used as risk identification technique.

Furthermore, experience of the organization from previous projects were preferably used in the identification process of risks. The study also indicated that the actions that were performed in the project to analyze risks were in a good status and done by considering the project document updating after assessment of risks that might occur in a project followed by a measurement system to analyze the risk.

Moreover, the project used a well-developed risk mitigation strategy to respond to risk and the impact of the response based on factors such as budget, schedule and resources are considered

while responding to risk. In addition, the study indicated that, there was well established risk register that incorporates various WASH construction project risks at various stage of the project, classifies the type risks based on their source like financial, compliance, legal, etc. The risk register was prepared by the respective director or manager and it is documented. When it comes to risk evaluation, the study revealed that risk management practice was evaluated and audited by internal auditors.

However, there are some factors stated as weakness in the study, such as weak project team involvement in the risk identification process, lack of training of project risk management training to project team members, environmental factors were not used as an input to plan uncertainties in its project plan; and lack of proper consideration of characteristics of the risk before analyzing the identified risk by the project. The study also showed that risk management usage in the planning stage of the project life cycle was higher than in the implementation stage, conceptual or closure phases, i.e., it contrasts with the view that risk management application in the conceptual phase is the most important. A study by (Bisrat, 2018) on assessment of Risk Management Practices of Ethiopian Public Health Institute found that risk planning is not included in the project plan.

There was inadequate risk management training for project members, and there was major knowledge gap towards what project risk management is and how it is implemented. And the author also discovered that all risk management stakeholders were not involved in the actual practice. Hence, he recommended provision of risk management training for project team members and also risk management practice in these projects to be participatory and inclusive.

A study by (Frezewd, 2016) on project risk management practice in Batu and Dukem town water supply project revealed that there was no established risk management plan or policy that details and defines the risk management activities for the project. Hence there was no set risk methodology, risk roles and responsibilities, risk categories, probability and impact scales, risk tolerances, frequencies of risk management activities and reporting, and the budget and schedule for risk management activities.

The study revealed that risk management was not performed as a continuous process and was usually applied at the implementation stage with no defined risk management role and responsibility and risk ownership.

A study by (Andenet, 2018), on project risk management of bank of Abyssinia ISAP project, found that project stakeholders did not have adequate risk management knowledge and experience, and lesson learned from previous projects did not incorporate in the risk identification process as there was no documented risk register.

Furthermore, the organization policy and procedure were inadequate to guide the project team to go through a disciplined risk management process, i.e., the institute didn't have well established formal project risk management practice. As a result, the project teams were unable to link business analysis of threats and opportunities and analysis of project risk strongly.

2.5 Conceptual Framework

The effective Risk management performance result of project cost, project time and project scope as well as project output delivery of the manufacturing projects are influenced by proper practice and application of the project risk management processes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter comprises the research design, population, sample and sampling technique, data collection methods, research procedures, data analysis methods, and in conclusion, the chapter summary.

3.2 Research Design

A research design is outline or plan that used to generate answers to research problems by collecting and analyzing the required data according to (Cooper and Schindler (2008), and Churchill (2002). Descriptive, exploratory and causal research designs are three type of research design. Since descriptive studies are concerned with specific predictions, narrations of facts and characteristics concerning individuals, groups or situations this study adhere to descriptive quantitative study. Quantitative data that would be collected in order to acquire advance statistical analysis of the study. This study utilized simple random sampling on this research. A case study approach used to assess on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA}.

3.3. Data Collection Methods

The study used both primary and secondary data collection procedures. Primary data was collected from the field through questionnaires. On the other hand, secondary data was collected through reading different research, journals and staff records from organization performance. This research used questionnaire survey which is the most common method.

3.3.1 Primary Data

3.3.1.1. Questionnaires

Primary data for the study gathered by using questionnaires which were managed to the targeted respondents. The choice of using questionnaires as method of data collection considering the fact that project of waters supply constructions somewhat to give for employees since busy working place and employees may have a limited time. Therefore, questionnaires distributed among the respondents who found their own time to fill them.

3.3.2. Secondary Sources

3.3.2.1. Documentary Review

Documentary review is a technique to obtain various information from various literature including books, journals, research papers and other documentary source relating to a certain field of study. Normally, it helps to gather both quantitative and qualitative and measure the consistency of information obtained through other techniques (Kothari, 2004). Termination letters of employees, financial reports, and human resource inventory files, department reports and any other documents that have relevant information to the study will be consulted.

3.4 Population and Sampling Design

3.4.1 Population

According to Cooper and Schindler (2008), population is defined as the total collection of elements under study whereby references have to be made. The total population of this study would be employees and customers of Addis Ababa water supply and sewerage author's (AWSSA). The total population is 5000 employees.

3.4.2 Area of the Study

The study conducted at Addis Ababa water supply and sewerage author's (AWSSA). A selected employees used as a case study because they have the largest number of employees and more likely have experience to high project of waters supply constructions needed compared to other waters supply constructions.

3.4.3 Sampling Design

Selecting respondents for a representative of the whole population is what sampling mean. (Mugenda & Mugenda 2003). Sampling is vital since it is impossible to take the entire population because of time, financial factors and errors which can discourage the researcher. In this research multiple methodologies have utilized to achieve an optimum representative sample. For this study simple random sampling is used.

3.4.3.1 Sampling Frame

Sampling frame is an objective list of the population from which the researcher can make a selection according to Cox and Hassard (2005). The sampling frame was obtained from selected employees. The sample frame consists of the valid full-time employees currently working at Addis Ababa water supply and sewerage author's (AWSSA).

3.4.3.2 Sampling Technique

The sampling method used in drawing samples from a population was driven by the objectives of the research activity. The sampling process was to be guided by the parameters in the population in line with specific objectives of the study (Cooper and Schindler, 2011). The study adopted simple random sampling to ensure that every one had an equal chance of being sampled, and also to ensure that different age groups were represented. Semi-structured questionnaires were then administered to obtain the necessary data.

3.4.3.3 Sample Size

According to Cooper and Schindler (2008), sample size is described as a smaller set of elements from the larger population. Mugenda (2003) argued that the choice of sample size is governed by the confidence you need to have in your data, level of certainty, and the accuracy. You require for any estimates made in your sample, the type of analysis you are going to undertake and finally the size of the total population from which your sample is drawn.

To determine the sample size that will be able to capture objective issues, we propose to use Krejcie & Morgan (1970). The sample computation will be as follows. Using all population for data collection is difficult for one researcher. So, it is difficult to use all population, and the researcher using formula developed by (Yamane, 1967).

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

Where N= number of total populations

n= sample

e=level of precision (5%)

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

Where N= number of total populations

n= sample

e=level of precision (5%)

$$n = \frac{5,0000}{1+5,000(0.05)^2} = 370$$

3.5 Methods of data analysis

Quantitative data analysis method was used to analyze the acquired data. Frequencies and percentages are employed in descriptive analysis to portray quantitative data in the form of tables and graphs. For analysis, the data was coded and entered into a computer using the statistical software for social science (SPSS Version 20).

Each independent and dependent variable's means, standard deviations, correlations, and frequency distribution are provided. The regression model was used to regress risk management practice on project of waters supply constructions to use against the independent variables. In this study, the mean and standard deviation are the most descriptive statistics utilized to describe the data.

The Statistical Package for Social Sciences (SPSS) version 20 was getting to be used to analyze both qualitative and quantitative collected data. The descriptive statistics (frequencies distribution) is applied to assess the extent of customer service delivery while the connection and thus, the influence of the broadband internet services dimensions are getting to be analyzed by using multiple regressions.

Data analysis that was conducted involved reducing the collected data to a manageable size, by developing summaries, through the utilization of data analysis techniques (Cooper and Schindler, 2008). The quantitative data was analyzed using both descriptive and inferential statistics. Descriptive statistics was utilized for measures of central tendencies (Mean, Median and Mode), and measures of dispersion (Variance, Standard deviation, Standard Error, and Percentiles).

3.6 Research Procedures

Research procedures refer to a detailed description of the steps to be taken and the conduct of research should be provided for by the purpose of the study. A pilot test involving respondents was carried out to check the validity, clarity and reliability of the contents of the questionnaire.

A pilot test was conducted for the study to detect whether weaknesses in design and instrumentation existed, and to provide data to measure reliability and validity of the study. According to Saunders *et al.,* (2009) a complete account of the research process including pilot testing, scheduling of the subjects and selection of the data collection instruments has to be conducted.

After the questionnaire was developed, it was subjected to a pilot test within the respondents of the employees of Addis Ababa water supply and sewerage author's (AWSSA) who were not taking part in the survey.

3.7 Validity and Reliability

Validity Test: since validity of a research study is a conceptual and scientific soundness, the test focused on eliminating or minimizing the effect of extraneous influences, variables and explanations that might detract the accuracy of the ultimate findings. After the researcher has constructed the questionnaire, pre-testing was done with persons who have knowledge of the area by allowing them to read it. This is done to ensure that the questionnaire is clear to respondents and can be completed in useful way (Adam et al., 2007), then, the instrument was evaluated by academic advisor prior to the data collection so as to Maintain its validity and to increase the accuracy and usefulness of the findings in which it allows greater confidences of the study.

Reliability test refers to the stability of the measure used to study the relationships between variables Ghauri, &Gronhaug. (2010), the questions in the questionnaire were designed taking into consideration the issues related to the problem and goals of the study and theories on the subject. The reliability of the study was conducted by using cronbach‟s alpha. Reliability refers to the consistent of measurements throughout the entire finding of the study and it is a determination of obtaining the same results with in the sample respondents. A comprehensive measurement must fulfill the tests of validity and reliability; validity is the most critical criterion that indicates the degree to which an instrument measures what it is supposed to measure (Kothari, 1984). Concerning the reliability, as Zikmund, et.al, (2009), the measure of internal consistency; a pilot test was conducted distributing questionnaires to the selected sample employees and analyzed using SPSS version 20.

3.8 Ethical Considerations

This study has observed all ethical considerations. It dually acknowledged all cited information in both the body and the reference section. In other words, no review/accessed document is used without acknowledging the sources. Concerning the questioner respondents': their consent was requested to ascertain their voluntary participation. Full description of the study, the purpose/intention, confidentiality and privacy protection are highlighted with a brief cover letter beforehand. In addition to this, the survey is kept anonymous/ nameless.

3.8.1. Validity Analysis

Validity analysis Is the extent to which differences discovered using a measuring device reflect genuine differences between individuals being tested (Kothari, 2004). Also, how accurately a mentioned measures what it is intended to measure to put it another way, validity is the most important criterion since it demonstrates how well an instrument measures what it is designed to assess. The construct validity of the research will be examined to confirm the quality of the research design material. According to Kothari (2004), content validity refers to how well a measuring instrument covers the topic under investigation. The content validity of an instrument is good if it contains a representative sample of the universe. It makes decisions based on judgment and intuition. It can also be determined by a panel of people who will judge how well the measuring device fits the standards, but there is no way to express it numerically. Professionals checked the content's validity based on this.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATIONS

4.1 Introduction

This section is organized by presenting the general information about the respondents, were presented and data collected through questionnaires were analyzed at the same time. This study was distributed 370 questioners, to respond the respondents. The first section of this chapter presents the profiles of respondents. The second section in this chapter is on the analysis, presentation and interpretation of the relationships under risk management practice and those factors. The presentation and interpretation were in line with the study's objective. The findings are presented in the form of tables showing frequencies, percentages, mean and standard

deviation. Since descriptive research design was used in this study, descriptive analysis was carried out in this chapter. For each research objective, descriptive analysis was first done by use of the percentiles and frequencies. The findings are based on the responses of sample Assessment on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage authorities with the help of structured questionnaire in the study area.

4.2 Questionnaire Response Rate

This chapter examines the elements of assessment on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage authorities. The survey had a sample size of 318 respondents, returning questionnaires, yielding a response rate of 86% percent. It is a reliable response rate for data analysis as Babbie (2002) positedthat any response of 50 % and above is adequate for analysis. Moreover, it is possible to generalize that as the response rate indicates all of the respondents were happy towards the study and its findings.

Table 4.1: Response Rate

No.	Respondents' category	Frequency	Percentage
1	Responded	318	86%
2	Did not responded	52	14%
Total		370	100%

(Source: survey data, 2023)

4.3 General Information of the Respondents

This section profiles the respondents in respect to gender, age, and level of education, year of experience and risk management practice to participate in one year of the respondents of practice

on project of waters supply constructions. The items in the research instruments used in the study informed profiling of the respondents.

4.3.1 Gender of respondents

Figure 4.2 genders of the respondent

Genders of the respondent					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	170	53.5	53.5	53.5
	female	148	46.5	46.5	100.0
	Total	318	100.0	100.0	

(Source: survey data, 2023)

The data sought on whether respondents were males or females. The study found it important to analyze gender distribution of the respondent so, as to compare the level of participation in managers and employees of on project of waters supply constructions in case of Addis Ababa water supply and sewerage authorities. The study did not consider any of the gender in the selection of respondents. Respondents asked to indicate their gender. From the findings of the males made the majority of the respondents at 170 (53.5 %) and the females at 148 (46.5 %) as shownthe above table. This indicates the majority of the respondents are males.

4.3.2 Age of the respondent

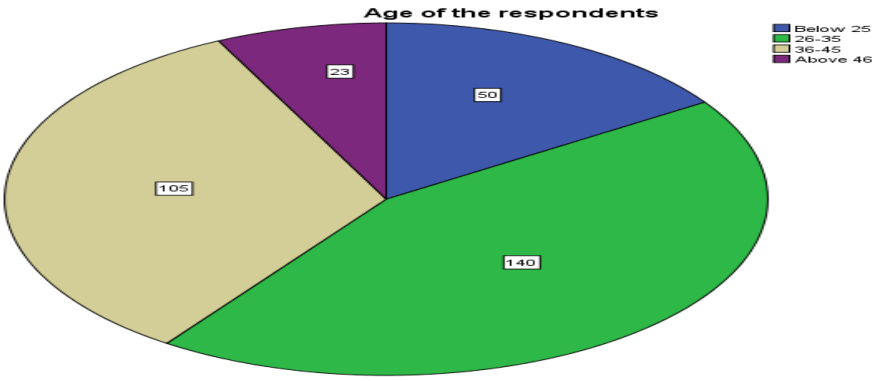

Figure 4.1 age of the respondents

Source: - own survey, 2023

From the given figure above Respondent asked to indicate their age group in years. This done to understand the age distribution of the respondents since an individual's age was not a consideration in the selection of respondents in this study. Age groups classified into four categories: as we see the below 25years; 26-35 years, 36-45 years and above 46 years. Regarding to respondent Age category in year majority 140 (44%) of respondents are participated at age of 26-35 years old, similarly the second highest number 105 (33%) of respondents are at age of 36-45 years. on other hand the list participated respondents are below 25 years old are 50(15.7) and finally above 56 years old are 7 (2.2 %). This confirms that 140 (44 %) of respondents were youths between the age of 26-35 years. About the age, distribution of the respondent majority of them found at young and youth age and well known the Assessment of risk management practice on project of waters supply constructions.

4.3.3 Education level of respondents

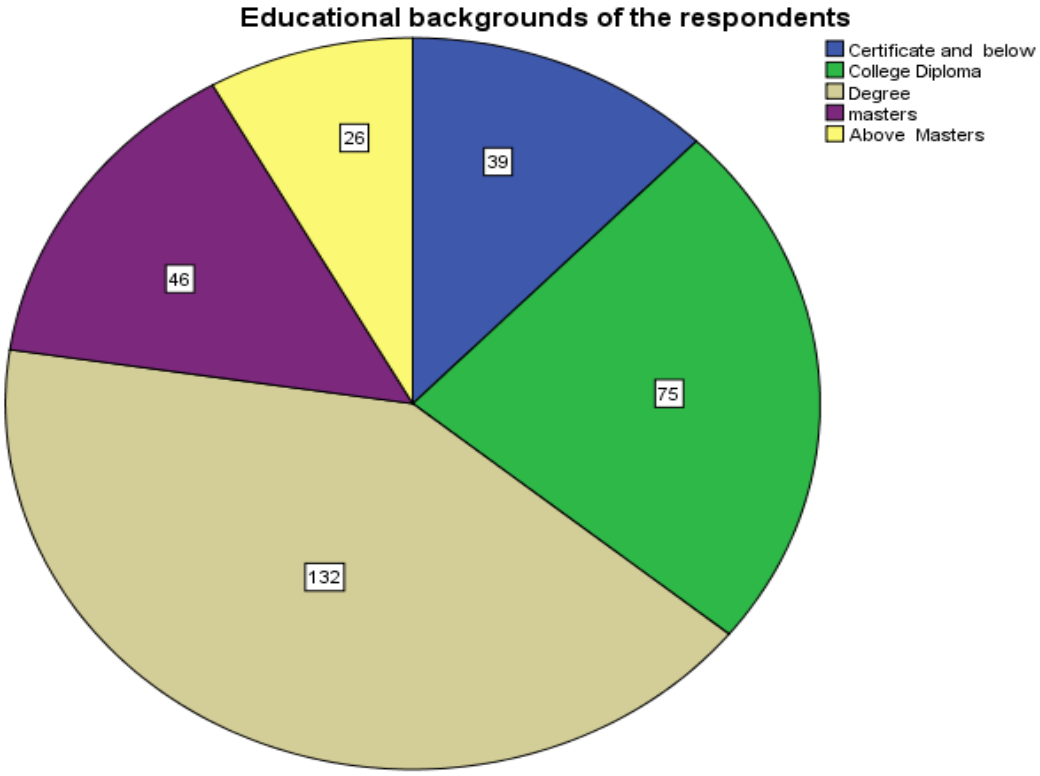

Figure 4.2. Educational levels of the respondents

Source: - own survey 2023

From the figure above the respondents asked to indicate their highest level of education. Respondent's level of education considered important in this study in respect to responding to the research instruments as well understanding risk management practice on project of waters supply constructions. The study sought to establish the educational level of respondents from the findings of the respondents 39 (12.3 %) had certified and below followed by those diplomas 75 (23.6%) whereas first degree was the majority of the respondents having 132 (41.5%) and with master's level of education having 46 (14.5%) as shown in the table above. Finally, 26 (8.2%) of the respondents are above masters. From this majority of the respondents are educated and have knowledge of risk management practice on project of waters supply constructions which ware first degree having 132 (41.5%).

4.3.4 Work Experience of respondents

Table 4.3 Work Experience of respondents

Work Experience of respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	below 1 years	25	7.9	7.9	7.9
	1-5 years	136	42.8	42.8	50.6
	6-10 years	92	28.9	28.9	79.6
	11-15 years	45	14.2	14.2	93.7
	above 15 years	20	6.3	6.3	100.0
	Total	318	100.0	100.0	

Source: - own survey, 2023

From the given table above the study sought to establish that the work experience of respondents. from the findings of the respondents below 1 years are 25 (7.9%), 1-5 years 136 (42.8 %) followed by those 6-10 years 92 (28.9 %), 11-15 years 45 (14.2 %), and above 15 years 20 (6.3 %) as shown the above table. So, the established of the work experience of the respondents from the findings the majority of them are from 1-5 years which is 136 (42.8 %) years followed by 6-10 years' work experience. About the education, distribution of the respondent majority of them found at young andyouth age which were found under work group.

4.4 Descriptive analysis of risk management practice

4.4.1 Descriptive analysis risk planning

The risk management plan is vital to communicate with and obtain agreement and support from all stakeholders to ensure the risk management process is supported and performed effectively over the project life cycle (PMI, 2013). The data analysis for this section helps to assess how risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The analysis of risk management practice on project of waters supply constructions was assessed by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.4 Risk planning

Descriptive Statistics			
	N	Mean	Std. Deviation
Planning meetings were hold to develop the risk management plan.	318	3.3208	1.32113
There was a participation of all key stakeholders and then risk management plan has obtained agreement and support from Them	318	3.8176	1.13924
The risk ensures that the degree, type, and visibility of risk management that commensurate with the project plan	318	2.9119	1.40249
The risk management methodology including the tools and data sources that are used in the risk management process were established	318	3.3648	1.29752
The project has team of experts with relevant experience in project risk management	318	3.4623	1.33510
Risks were identified during work breakdown structure	318	3.90	.974
There is a policy and procedure that guide the project team to go through a disciplined risk management process	318	3.8050	1.11190
There is a detailed formulation of actions in a project for the management of risk	318	3.9119	1.07676

There is a clear set of objectives and the goals of the risk management process	318	3.7799	1.13809
documenting of a risk management strategy prepared	318	3.8145	1.02347
Valid N (listwise)	318		
Aggregate mean and STD		3.60887	1.18167

Source: own survey, 2023

The results displayed in Table 4.4 show that sample mean for individual responses varied between 2.9119 and 3.9119 tending on the Likert scale. These values of sample translated to agreement amongst respondents that the set of activities represented by the statements on risk planning were in essence undertaken in Addis Ababa water supply and sewerage author's (AWSSA). Moreover, the sample standard deviation for the separate responses varied between 0.974and 1.40249 demonstrating that the individual responses were clustered together around the values of sample mean.

Similarly, the aggregate scores for sample mean and sample standard deviation for risk planning were 3.60887and 1.18167 respectively. In this case, the overall responses on risk planning which depicted that collectively variability of responses was narrow for the set of measures of risk planning. Therefore, the sample mean for risk planning is a suitable estimator of the population parameter and thus can support making conclusions concerning the population. The resulting low level of variability confirmed that the activities that were used as measures of risk planning are practiced in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance.

Furthermore from the study findings, majority of the respondent agreed that There is a detailed formulation of actions in a project for the management of risk (Mean = 3.9119 STD =1.07676), Risks were identified during work breakdown structure (Mean = 3.90 STD =0.974), There was a participation of all key stakeholders and then risk management plan has obtained agreement and support from them, documenting of a risk management strategy prepared , (Mean = 3.8176 STD =1.13924), documenting of a risk management strategy prepared, (Mean = 3.8145 STD =1.02347), There is a policy and procedure that guide the project team to go through a disciplined risk management process, (Mean = 3.805 STD = 1.1119) respectively

On the other hand the remaining respondents stated that There is a clear set of objectives and the goals of the risk management process (Mean = 3.7796 STD = 1.13809), the project has team of experts with relevant experience in project risk management (Mean = 3.4623 STD = 1.33510), Planning meetings were hold to develop the risk management plan (Mean = 3.320 STD = 1.32113) and finally The risk ensures that the degree, type, and visibility of risk management that commensurate with the project plan (Mean = 2.9116 STD = 1.40249)

In general respondents highly agree that risk planning has are practiced in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance. Plan Risk Management is the process of defining how to conduct risk management activities for a project. The key benefit of this process is it ensures that the degree, type, and visibility of risk management are commensurate with both the risks and the importance of the project to the organization.

4.4.2 Descriptive analysis Risk identification

Identify Risks is the process of determining which risks may affect the project and documenting their characteristics. The key benefit of this process is the documentation of existing risks and the knowledge and ability it provides to the project team to anticipate events (PMI, 2013). The data analysis for this section helps to assess how risk identification practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The analysis of risk identification practice on project of waters supply constructions was assessed by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.5 Descriptive analysis Risk identification

Descriptive Statistics			
	N	Mean	STD
Risks are identified throughout the project lifecycle	318	3.5503	1.31083
The project team is involved in the risk identification process.	318	3.6572	1.26546

Systemic approach is applied for the identification of risk	318	3.5157	1.30205
A clear description of the risks with the cause and effects are understood and documented.	318	3.5849	1.23973
Risk register is produced as an output in risk identification process	318	3.7327	1.22832
The project has a defined or standard risk managementprocess.	318	3.8333	1.17836
Valid N (listwise)	318		
Aggregate mean and STD		3.6456	1.25333

Source; own survey, 2023

According to the results displayed in Table 4.5 show that sample mean for individual responses varied between 3.5157and 3.8333 tending on the Likert scale. These values of sample translated to agreement amongst respondents that the set of activities represented by the statements on Risk identification were in essence undertaken in Addis Ababa water supply and sewerage author's (AWSSA). Moreover, the sample standard deviation for the separate responses varied between 1.17836 and 1.31083 demonstrating that the individual responses were clustered together around the values of sample mean. Similarly, the aggregate scores for sample mean and sample standard deviation for Risk identification were 3.6456 and 1.2533 respectively.

In this case, the overall responses on Risk identification which depicted that collectively variability of responses was narrow for the set of measures of Risk identification. Therefore, the sample mean for Risk identification is a suitable estimator of the population parameter and thus can support making conclusions concerning the population. The resulting low level of variability confirmed that the activities that were used as measures of Risk identification are practiced in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance.

Furthermore, from the study findings, most of the respondent agreed that the project has a defined or standard risk managementprocess (Mean = 3.8333 STD =1.17836), Risk register is produced as an output inrisk identification process (Mean = 3.7327 STD =1.17836), the project

team is involved in the riskidentification process (Mean = 3.6572 STD =1.26546) respectively. Identify Risks is the process of determining which risks may affect the project and documenting their characteristics. The key benefit of this process is the documentation of existing risks and the knowledge and ability it provides to the project team to anticipate events (PMI, 2013)

On the other hand, respondents stated that A clear description of the risks with the cause and effects are understood and documented (Mean = 3.5849, STD =1.23973), Risks are identified throughout the projectlifecycle (Mean = 3.5503, STD =1.31083), Systemic approach is applied for theidentification of risk (Mean = 3.5157, STD = 1.30205) respectively.

In general respondents highly agree that risk identification was practiced in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance. Identify risks is an iterative process, because new risks may evolve or become known as the project progresses through its life cycle. The frequency of iteration and participation in each cycle will vary by situation.

The format of the risk statements should be consistent to ensure that each risk is understood clearly and unambiguously in order to support effective analysis and response development. The risk statement should support the ability to compare the relative effect of one risk against others on the project. The process should involve the project team so they can develop and maintain a sense of ownership and responsibility for the risks and associated risk response actions. Stakeholders outside the project team may provide additional objective information (PMI, 2008).

4.4.3 Descriptive analysis Risk Analysis

perform Qualitative Risk Analysis is the process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact. The key benefit of this process is that it enables project managers to reduce the level of uncertainty and to focus on high priority risks (PMI, 2013). The data analysis for this section helps to assess how risk analysis practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The analysis of risk analysis practice on project of waters supply constructions was assessed by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.6 Descriptive analysis Risk Analysis

Descriptive Statistics			
	N	Mean	Std. Deviation
There is a measurement system to analyze the risk	318	3.5818	1.27259
identified risks are numerically analyzingthe effect of an overall project objectives	318	3.5881	1.25720
An assessment is done for the probability of achieving project objectives	318	3.7327	1.22832
Identify realistic and achievable cost, schedule and scope targets, given the project risks.	318	3.2044	1.31925
Project documents are updated after risksare analyzed quantitatively	318	3.3711	1.33647
Valid N (listwise)	318		
Aggregate mean and STD		3.4936	1.2828

(Source: SPSS output survey data, 2023)

From the given table, the aggregate mean and STD of risk analysis is 3.4936 and 1.2829. this indicate that risk analysis weere practiced moderately in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance.

According to the major finding in this study most respondents stated that An assessment is done for the probabilityof achieving project objectives (Mean = 3.7327, STD = 1.22832), identified risks are numerically analyzingthe effect of on overall project objectives (Mean = 3.5881, STD = 1.2572), There is a measurement system to analyze the risk (Mean = 3.5818, STD = 1.27259), Identify realistic and achievable cost, schedule and scope targets, given theproject risks(Mean =

3.3711, STD = 1.33647 and finally Identify realistic and achievable cost, schedule and scope targets, given theproject risks (Mean = 3.2044, STD = 1.31925) respectively.

Perform Qualitative Risk Analysis is the process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact. The key benefit of this process is that it enables project managers to reduce the level of uncertainty and to focus on high-priority risks (PMI, 2013).

Perform Qualitative Risk Analysis assesses the priority of identified risks using their relative probability or likelihood of occurrence, the corresponding impact on project objectives if the risks occur, as well as other factors such as the time frame for response and the organization's risk tolerance associated with the project constraints of cost, schedule, scope, and quality. Such assessments reflect the risk attitude of the project team and other stakeholders. Effective assessment therefore requires explicit identification and management of the risk approaches of key participants in the Perform Qualitative Risk Analysis process.

4.4.4 Descriptive analysis Risk Response

Plan Risk Responses is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives. The key benefit of this process is that it addresses the risks by their priority, inserting resources and activities into the budget, schedule and project management plan as needed (PMI, 2013). The data analysis for this section helps to assess how risk response practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The analysis of risk response practice on project of waters supply constructions was assessed by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.7 Descriptive analysis Risk Response

Descriptive Statistics			
	N	Mean	Std. Deviation
The project has planned responses as opposed to considering risks as they arise.	318	3.7075	1.21479

The project has developed strategies in order to prevent or mitigate all the identified risks	318	3.9025	1.15921
Assigning of one or more persons for each agreed to risk response is in place	318	3.6101	1.16420
A decision tree analysis method is in place to choose the most appropriate response	318	3.7547	1.18730
Options and actions are developed to enhance opportunities and to reduce threats to project objectives	318	3.6195	1.24196
The project has planned responses as opposed to considering risks as they arise.	318	3.3805	1.33263
Valid N (listwise)	318		
Aggregate mean and STD		3.6626	1.21668

(Source: own survey 2023)

From the above table, the aggregate mean and STD of risk response were (Mean = 3.6626, STD =1.21668). this indicate that risk response was practiced highly in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance.

In the given table above most respondents stated that the project has developed strategies in order to prevent or mitigate all the identified risks (Mean = 3.905, STD =1.15921), A decision tree analysis method is in place to choose the most appropriate response (Mean = 3.7547, STD =1.1.18730), The project has planned responses as opposed to considering risks as they arise (Mean = 3.7075, STD =1.21479), Options and actions are developed to enhance opportunities and to reduce threats to project objectives (Mean = 3.6195, STD =1.24196), Assigning of one or more persons for each agreed to risk response is in place (Mean = 3.6101, STD =1.16420), and finally the project has planned responses as opposed to considering risks as they arise. (Mean = 3.38059, STD =1.33263)

Plan Risk Responses is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives. The key benefit of this process is that it addresses the risks by their priority, inserting resources and activities into the budget, schedule and project management plan as needed (PMI, 2013).

The Plan Risk Responses process follows the Perform Quantitative Risk Analysis process (if used). Each risk response requires an understanding of the mechanism by which it will address the risk. This is the mechanism used to analyze if the risk response plan is having the desired effect. It includes the identification and assignment of one person (an owner for risk response) to take responsibility for each agreed-to and funded risk response.

4.4.5 Descriptive analysis Risk monitoring and Control

Control Risks is the process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project. The key benefit of this process is that it improves efficiency of the risk approach throughout the project life cycle to continuously optimize risk responses (PMI, 2013). The data analysis for this section helps to assess how Risk monitoring and Control practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The analysis of Risk monitoring and Control practice on project of waters supply constructions was assessed by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.8 Descriptive analysis Risk monitoring and Control

Descriptive Statistics			
	N	Mean	Std. Deviation
Risks that occur within the project are controlled in a way that goes with the goal and objective of the project	318	3.0409	1.33677
Project management plan, project documents and organizational process assets are updated after monitoring and control process	318	3.7358	1.20175

New risks are identified and Residual risks are monitored	318	3.7296	1.10739
Project team hold periodic meetings specifically for risk discussions	318	3.5472	1.20041
Effectiveness of risk management process is evaluated throughout the project	318	3.6541	1.26585
Valid N (listwise)	318		
Aggregate mean and STD		3.5415	1.22199

Source: own survey 2023

According to the results displayed in Table 4.5 show that sample mean for individual responses varied between 3.0409 and 3.7358 tending on the Likert scale. These values of sample translated to agreement amongst respondents that the set of activities represented by the statements on Risk monitoring and Control were in essence undertaken in Addis Ababa water supply and sewerage author's (AWSSA).

Moreover, the sample standard deviation for the separate responses varied between 1.10739and 1.33677 demonstrating that the individual responses were clustered together around the values of sample mean. Similarly, the aggregate scores for sample mean and sample standard deviation for Risk identification were 3.5415 and 1.22199 respectively. In this case, the overall responses on Risk monitoring and Control which depicted that collectively variability of responses was narrow for the set of measures of Risk identification.

Therefore, the sample mean for Risk monitoring and Control is a suitable estimator of the population parameter and thus can support making conclusions concerning the population. The resulting low level of variability confirmed that the activities that were used as measures of Risk monitoring and Control are practiced in Addis Ababa water supply and sewerage author's (AWSSA) and are indeed crucial for the AWSSA performance.

Furthermore, from the study findings, most of the respondent agreed that t Project management plan, project documents and organizational process assets are updated after monitoring and control process (Mean = 3.7358 STD =1.20175), New risks are identified and Residual risks are monitored (Mean = 3.7296 STD =1.10739), Effectiveness of risk management process is evaluated throughout the project (Mean = 3.6541 STD =1.23585) respectively.

On the other hand, Project team hold periodic meetings specifically for risk discussions (Mean = 3.5472 STD =1.20041), and finally Risks that occur within the project are controlled in a way

that goes with the goal and objective of the project (Mean = 3.0409 STD =1.33677) According to Kerzner (2009), the monitoring and control process systematically tracks and evaluates the effectiveness of risk response actions against established metrics. Monitoring results may also provide a basis for developing additional risk response strategies, or updating existing risk response strategies, and reanalyzing known risks. In some cases, monitoring results may also be used to identify new risks and revise some aspects of risk planning. The key to the risk monitoring and control process is to establish a cost, technical performance, and schedule management indicator system over the program that the program manager and other key personnel use to evaluate the status of the program. The indicator system should be designed to provide early warning of potential problems to allow management actions. 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.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The major purpose of the study was to assess on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). 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 were inadequate to guide the project team to go through a disciplined risk management process. As a result, the project teams were unable to link business 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 methodologyincluding 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 wasn't applied and also the description of the risks with the cause and effect lacks clarity. In addition, quality management plan and human resource management plan weren't used as input and document review, checklist analysis and SWOT analysis as a tool in risk identification. Moreover, internal risks were commonly encountered in the project followed by project specific risk and external risk. According to

response of majority of the respondents in qualitative risk analysis revealed that assessments were not done by factual information and risks weren't analyzed based on financial impact. In addition, project documents weren't be updated after risks were analyzed qualitatively.Moreover, the practice of risk response was primarily mitigate followed by transfer and accept.

In quantitative risk analysis, no input and tools were used. As a result, identified risks weren't analyzed numerically its effect on the overall project objectives and financial impact. In addition, realistic achievable cost, schedule and scope targets weren't identified with the given project risk. Moreover, project documents weren't updated after risk was analyzed quantitatively. In risk response, strategies for positive risks or opportunities, contingent response strategies weren't used as a tool and techniques in risk response. As a result, a 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 weren't updated.

The result obtained from the assessment of risk monitoring and control practice revealed that technical performance measurement, reserve analysis, variance and trend analysis weren't used as a tool and techniques in risk monitoring and control. In addition, there was a limitation in evaluating the effectiveness of risk management process throughout the project. The risk monitoring and control process also lacks continuity. As a result, risks that occur within the project weren't controlled in the way that goes with the goal and objective of the project. Moreover, project management plan, project documents and organizational process assets weren't updated. Furthermore, important inputs, tools and techniques weren't used effectively during the process of risk planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response, risk monitoring and control.

5.2 Conclusion

The aim of this research was to assess the risk management practice of AWSSA water supply construction project towards risk planning, identification, analysis, response planning and monitoring and controlling processes. Based on the findings mentioned in chapter four, the analysis part of the study, the following conclusions are drawn.

Firstly, the practice of proper risk management planning was absent with no involvement of relevant stakeholders in the process. The purpose and objective of project risk management was not clearly established and communicated to project stakeholders. The project did not set clear risk management methodologies, tools and techniques, have guidance for risk rating, assign risk management role and responsibilities, establish time frame for risk management activities, articulate risk appetite and tolerance limits and set risk reporting and documentation requirements and communicate it with project stakeholders.

The project did not utilize specific tools and techniques to plan its risk management and incorporate risk management plan in its project management plan. Hence, the practice of risk planning was poor. Secondly, this paper revealed that the project did not identify a broad range of risks throughout the project lifecycle with involvement of appropriate stakeholders. The term 'risk' was not carefully defined and communicated to all project stakeholders. The project identification process only considered negative risks by avoiding positive risks (opportunities). The project did not regularly scan the environment in an effort to identify unknown, but potentially emerging risks such as inflation, new regulations, etc.

The primary method used by the project to identify risk was assumption analysis and documentation review. The participants in the risk identification considered project objectives, constraints, and assumptions in the risk identification process. Risk identification results from previous similar projects were also reviewed and to identify potential risks.

Nevertheless, it did not use expert judgement, and checklist analysis, SWOT analysis and diagramming techniques. Besides, there was no established risk register. All in all, the project risk identification practice is relatively poor and seeks major attention.

Thirdly, the actions that were performed in the project to analyze risks were in a relatively good status and though done by using only qualitative risk analysis techniques as the main tools and techniques. Inherent risks were assessed and risks were evaluated and prioritized based their probability of happening and severity of impact to project objectives.

However, there was no defined and consistently applied guideline or metric scale on how to assess both likelihood and impact. Besides, the result of the risk assessment was not periodically reported to the project stakeholders for discussion and further actions and the project used only qualitative risk analysis techniques, not quantitative techniques, to analyze risks.

Fourthly, the project did not perform well towards risk response planning. The project mainly used risk mitigation and risk transfer strategies to response for the identified negative risks (threats). However, response for positive risks such as exploit, enhance and share were not used in the project; and contingency plan and fallback plan were not developed and implemented to address those risks where the existing response was insufficient.

The effectiveness of the existing response plan, in terms of funding, resource, and schedule constraints and their alignment of project's goals, was not assessed. The existing response(s) to the project's most significant risks were not properly documented and appropriate risk response responsibilities were not assigned to respective stakeholders.

Besides, the project did not encourage collaboration and communication between project team members and key stakeholders to enhance the identification and development of possible risk response strategies. In general, the planned responses were not incorporated into the overall project management plan.

Finally, the project's risk monitoring and controlling practice was very weak where the project did not assess the effectiveness of its project risk management practice to improve its risk management activities. The project did not also evaluate whether the existing response was sufficient to manage the risks, subsequently, did not identify another potential preventive actions. The only tool that was used by the project to monitor and control its risks was status meeting techniques by avoiding other useful techniques such as risk reassessment, risk audit, variance and trend analysis, technical performance measurement and reserve analysis.

The project lacked to identify emerging risks that seeks immediate management's and/or board's attention. Therefore, neither the project manager nor the board regularly reviewed risk report to obtain an understanding of the status of critical risks and/or risk response plans. Hence, the project did not encourage risk communication within project stakeholders. There was also poor practice of sharing lessons learned among project team members, as a result, the project usually repeated same mistakes. Maintenance of risk documentation was also poor.

In general, as the overall effectiveness of the project's risk management practice is poor with no standard and formal risk management process, there should be significant work to be done to evolve the risk management practice of the project to the next level. The project did not regard risk management as an ongoing process that continues through the life of a project. Project risk management was not considered as important issue that requires dedicated staff, resource and appropriate training. Hence, the project's stakeholders did not get formal risk management training or guidance; and there was no a special department or assigned person to handle uncertainties that occur within the lifecycle of the project and that is equipped with adequate resources. Despite the project's effort to evaluate risk events that have already occurred, it lacked to identify future uncertainties that will affect its project objectives, hence, project stakeholders were frequently surprised by poor project performance, such as project cost or schedule overruns.

Therefore, Addis Ababa water supply and sewerage author's (AWSSA) has to amend its risk management practices for future projects.

5.3 Recommendation

Based on the final findings of the study, there are some recommendations. These recommendations are important to improve the project risk management practice of Addis Ababa water supply and sewerage author's (AWSSA).

- 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, stakeholder register& tools and techniques such as analytical techniques), risk identification (inputs such as human resource management plan and quality management plan & tools and techniques such as checklist analysis, documentation review and SWOT analysis). risk analysis(inputs such as risk management plan, enterprise environmental factors, schedule management plan, cost management plan, risk register and organizational process assets & tools and techniques such as expert judgment, modeling technique, data gathering and representation technique), risk response(tools and techniques such as strategies for positive risks or opportunities and contingent response strategies), risk monitoring and control(tools and techniques such as technical performance measurement, risk reassessment, risk audit, reserve analysis, variance and trend analysis).
- the risk management plan should be prepared with detail requirement gathering, the risk management plan should have strong linkage with business analysis of threats and opportunities and analysis of project risk, Financial impact of the risk that hinder the project objective should be numerically specified, Contingency should be allocated to mitigate the risk that occur in the project, Project teams should be motivated by using different motivational factors and Effectiveness of the risk management process should be evaluated throughout the project.

5.4 Future area of research

Future research can be carried out to determine the relationship between project risk management maturity and project management success.

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Appendix -A

Questionnaire Prepared for respondents

Dear respondents;

These survey questionnaires designed for master thesis accomplishment needed for partial fulfillment of master of art degree in ..... by student at..... University. So the objective of this questionnaire is to collect information for the study conducted on Assessment on risk management practice on project of waters supply constructions in case of Addis Ababa water supply and sewerage author's (AWSSA). The information you provide below was be essential for accomplishment of this study. Therefore, your genuine, honest, and prompt response is a valuable input for the quality and successful completion of the research. The information you give is used only for academic purpose and was been kept confidential.

Thank you in advance!!!

Directions for filling the questionnaires

- ❖ Do not write your name
- ❖ Put "√ or ×" mark in the box provided for choice questions
- ❖ Your response was being utilized only for the purpose of this survey

Part I: General Information

1. Sex: Female ☐ Male ☐
2. Educational level: Diploma ☐ Degree ☐ Masters ☐ PhD Other ☐ (Specify_____
3. In which age group are you? ☐ 25 and below ☐ 26-35 ☐ 36-45 46-55 ☐ 56 & above ☐
4. How long have you been working for your current organization?Below 1 1-5 ☐ 6-10 ☐ 11-15 ☐ Above 15 ☐

Part II: questions related to Assessment of risk management practice on project of waters supply constructions

Instruction: Please indicate the extent to which you either agree or disagree with the following statements by marking a tick mark √ or × in the appropriate column to the right side where 1= strongly disagree 2=Disagree 3=Neutral 4=Agree 5=strongly agree

1. Questions on risk planning

No.	Questions Items	1	2	3	4	5
1	Planning meetings were hold to develop the risk management plan.					
2	There was a participation of all key stakeholders and then risk management plan has obtained agreement and support from Them					
3	The risk ensures that the degree, type, and visibility of risk management that commensurate with the project plan					
4	The risk management methodology including the tools and data sources that are used in the risk management process were established					
5	The project has team of experts with relevant experience in project risk management					
6	Risks were identified during work breakdown structure					
7	There is a policy and procedure that guide the project team to go through a disciplined risk management process					
8	There is a detailed formulation of actions in a project for the management of risk					
9	There is a clear set of objectives and the goals of the risk management process					
10	documenting of a risk management strategy prepared					

2. Risk identification

No.	Questions Items	1	2	3	4	5
1	Risks are identified throughout the projectlifecycle					
2	The project team is involved in the riskidentification process.					
3	Systemic approach is applied for theidentification of risk					
4	A clear description of the risks with the cause and effects are					

	understood and documented.					
5	Risk register is produced as an output in risk identification process					
6	The project has a defined or standard risk managementprocess.					

3. Questions on Risk Analysis

No.	Questions Items	1	2	3	4	5
1	There is a measurement system to analyze the risk					
2	identified risks are numerically analyzing the effect of on overall project objectives					
3	An assessment is done for the probability of achieving project objectives					
4	Identify realistic and achievable cost, schedule and scope targets, given theproject risks.					
5	Project documents are updated after risks are analyzed quantitatively					

4. Question concerning to Risk Response

No.	Questions Items	1	2	3	4	5
1	The project has planned responses as opposed to considering risks as they arise.					
2	The project has developed strategies in order to prevent or mitigate all the identified risks					
3	Assigning of one or more persons for each agreed to risk response is in place					
4	A decision tree analysis method is in place to choose the most appropriate response					
5	Options and actions are developed to enhance opportunities and to reduce threats to project objectives					

5. Questions Concerning to Risk monitoring and Control

No.	Questions Items	1	2	3	4	5

1	Risks that occur within the project are controlled in a way that goes with the goal and objective of the project					
2	Project management plan, project documents and organizational process assets are updated after monitoring and control process					
3	New risks are identified and Residual risks are monitored					
4	Project team hold periodic meetings specifically for risk discussions					
5	Effectiveness of risk management process is evaluated throughout the project					