Assessment of risk management practices on housing projects: the case of Bole Arabsa housing project

BY
ABEBE DEMISSE G/MICHAEL

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ABEBE DEMISSE G/MICHAEL

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This is to certify that the research project presented by Abebe Demisse entitled "Assessment of risk management practices on housing projects: the case of Bole Arabsa housing project" and submitted in partial fulfillment of the requirements for the degree of Masters of Art in Project Management.

Signed by Examining Committee

Examiner (Internal)…Dr. Muluadam Alemu… Signature  …Date…14/07/2021…

Examiner (External)…… Signature ……Date…….

Advisor…… Signature ……Date……..

Declaration

I declare that this thesis entitled "**Assessment of risk management practices on housing projects: the case of Bole Arabsa housing project**" is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree. To the best of my knowledge and belief this thesis contains no materials previously published or written by another person except where due reference is made.

Candidate:

Name: Abebe Demisse

Signature: _____

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Abstract

Risk management is recognized as an important exercise in order to achieve better performance of construction projects. Success in construction project is indicated by its performance in the achievement of project time, cost, quality, safety and environmental sustainability objectives. The housing projects run a high risk of being over budget and significantly late. While some degree of cost and time schedule risks is inevitable in construction projects, it is possible to improve risk management strategies to minimize their negative impact. This study tried to assess the practice of project risk management in Bole Arabsa housing project. The researcher has used descriptive research design. The data collection tools were questionnaire. The sample size of the study was 259 individuals who were selected through cluster sampling. The response rate was 100%. The sample size was selected through cluster sampling and a questionnaires with an item of 49 was distributed to the team members and individuals who are involved with the projects. The findings of the study revealed that there is no well-organized policy or guideline that recommend how to manage risks in the projects. The project doesn't usually follows a defined or standard risk management process. Majority of respondents believed risk management is not treated as a continuous process in the project. The finding of the result showed irregularity as far as handling of uncertainties that occur within the project. Careful plan is not designed for the projects to overcome or handle uncertain events that may take place. Even though few respondents reported the project use of risk identification such as expert judgment, checklist, document review, information gathering, & assumption analysis, most of them disagree the existence of the practice of these method in the project. According to the respondents the majority source of risk in the project was human risk followed by technical and financial risks. Majority of respondent disagree the existence of well-developed strategy to respond to uncertainties if they occur. The project lags behind in the practice of risk monitoring and control within the project. Furthermore, risk management culture is very low in the enterprise. Generally, the outcome of the research confirmed that risk management practice is implemented to some extent but there is a gap between the theory of project risk management which should be applied and the actual practice that is performed by the project sites. Therefore, possible recommendations are preparation of proper policy or guideline, review priority of risk response strategy, establish a cross checking mechanism for monitoring and controlling process and Provision of training to employee.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Research

Construction industry is an important industry worldwide. Construction industry has accomplished extensive growth worldwide particularly in past few decades. The construction industry generally defined as a sector of the economy. The Industry is playing an important role in economic growth of the country. The Ethiopian construction industry is characterized by a large number of micro-entrepreneurs, the majority of whom operate in the country's informal economy. Ethiopia's formal construction sector comprises indigenous and those firms, as well as numerous major foreign civil engineering and construction companies. Although all contractors are required to be registered with the Ethiopian Ministry of Urban Development and Construction. But it faces many challenges currently that lead to affect project goal and steady growth of the economy. For instance, managing risk and uncertainty play great role in the success of the given project (Addis Zemen News Letter 76th, No.172).

Addis Ababa, the capital city of Ethiopia as well as the capital city of Africa and also it is the largest seat of international organization, remain with high population estimated 3,470,000, Poor living standard, high level of unemployment(40%), housing deficit about 850,000,about 70% of the population lives in slums with inhuman and unhygienic conditions,35% of the solid waste generated by the city is not collected ,only about 9% of the built up has connected with a sewer system, about 71% of households do not have adequate sanitation. Even though in the Millennium Development Goal Cities are expected without slum and reduction of poverty by 50% up to 2015 Internationally agreed Millennium Development Goal, but the problem of housing and poverty continued in the worst condition in Addis Ababa (UN-Habitat, 2014). The city admiration develops a housing project to tackle the residential problem of the society. Registration takes placed in 2004 G.C for the first time and in 2012 G.C for the second time. In the form of 10/90, 20/80 and 40/60 payment mode.

The Ethiopian Government took considerable action under the course of the Ethiopian Integrated Housing Development Program (IHDP). In this grand program the government constructed thousands of condominium houses in different towns in the country. Addis Ababa housing development office is one of the organs established to construct and transfer condominium houses for city inhabitants. In the last two registration program 2004 G.C and 2012 G.C about 974,835 residents were register for the condominium houses, within 12 years only 176,065.00 houses are constructed and transferred to beneficiaries (AAHCPO, 2016). Because of financial problem and lack of construction management skills: the performance outrageous in its speed and accessibility. According to recent study, 'the office needs 55 years to access the condominium houses for all the registered dwells' (Addis Zemen News Letter 76th, No.172). So there is trepidation of not achieving IHDP goal that targets low and middle income inhabitants. The main tailback on the success of the program is matter of affordability, time of delivery and performance of the housing unit. Housing agency starts different projects in different areas.

Bole Arabas is one of the site that contain many projects within it. As a construction project this project passes through different phases in order to realize the required goal or outcome.

Construction projects comprise of five major phases namely initiation, planning, execution, monitoring and evaluation and close out. Each phase has its own typical risks. The risks at planning phase include poor scope definition, poor estimates and budget based on incomplete data. The programming and design may have risks such as over-design, poor constructability, poor estimating and scope creep. The planning phase is often plagued by risks of incomplete documents, poor contracting strategy, insufficient competition and fraud in the bidding process. The execution phase is faced with risks of change orders, delays and quality concerns. The risks at project close out include snag/punch lists issues, insufficient time for testing and commissioning and claims. Every project go through the above listed project phases. This implies either positive or negative effect would happened because of the existence of the risk and uncertainty to the project.

Risk is perceived as; the potential for unwanted or negative consequences of an event or activity towards the project objective. Recent research tends to emphasize the two-edged nature of risks, such as 'a threat and a challenge' or combination of hazard and exposure. Risk is the chance of something happening that will have an impact on objectives; may have a positive or negative impact and combination of the probability or frequency of occurrence of a defined threat or opportunity and the magnitude of the consequences of the occurrence (Zhang, et al, 2007). This paper examines mainly the negative impacts of risks inherent in construction projects through a combined consideration of the likelihood of occurrence and the magnitude of consequence.

Risk is the statement of what may arise from that lack of knowledge. Risks are gaps in knowledge which we think constitute a threat to the project (Cleden, 2009). Risks occur where there is some knowledge about the event (Smith, et al, 2006). Risk is a possibility of loss or injury (Darnall & Preston, 2010). Its absence of information or presence of little information about the upcoming event that lead to impact the project negatively.

In addition to the different definitions of risk, there are various ways for categorizing risk for different purposes too. Some categorize risks in construction projects broadly into external risks and internal risks while others classify risk in more detailed categories of political risk, financial risk, market risk, intellectual property risk, social risk, safety risk, etc. Risks can be categorized or viewed as business, technical or operational. Business risk inability to with stand business world competition. A technical risk is the inability to build the product that will satisfy requirements. An operational risk is the inability of the customer to work with core team members (Neeraj & Balasubramanian, 2015).

Risk management is one of the most critical factors in project management practices to verify a project is successfully completed. Having defined the meaning of risk, the next step is to determine the meaning of Risk Management process. Risk Management process is a formal process, via which we can achieve identification, analysis and response to risks, throughout the lifecycle of a project, in order to obtain the optimum degree of risk elimination, mitigation and control (Wang & Dulaimi, 2004). Thus, risk management approach or system will determine the success of the project. Risk management system

raised in the form of management process. There is a detailed and widely expressed literature about accepted risk management process. A simple, common and systematic approach to risk management, suggested by Turnbaugh (Turnbaugh, 2005). Risk Identification, risk quantification and risk response and development control are the three consecutive stages of risk management process. In risk identification stage staring form identification of the risk, determining the types of risks, identify and finally it assess the potential risks in the project. Risk quantification, the second stage of risk management process which involves measuring of the probabilistic characteristics and the degree of the impacts. Finally, Risk response and development control process would be used to define opportunities for managing changes in risk during the project life cycle.

The purpose of the Risk Management process in a wider sense should not solely be to ensure a successful project completion but also to increase the expectations of project goals and objectives (Mills, 2001). Cost, schedule and performance are the primary measures of a project's success. A project is said to be successful if it is completed within the planned cost and time. Developing countries are faced with the problem of scarce project financial resources. Construction has an important role in the economy of many countries and especially developing countries. The construction industry contributes to the GDP and employment rate of many nations and for this reason it is considered vital for the economic development of any nation (Olwale & Sung, 2010). The performance of a project measured in the comparison to the planed objective of the project. Measuring instrument for the project are Cost, schedule and performance deviation to plane. The three major types of risk are; cost risk, schedule risk and performance risk. In Ethiopia most projects face one of the three or more than one. According to study done in 2011 on average, there is about 15.33% cost increment beyond the initially estimated cost and about 84% time overrun according to (Hauke & Kossowski, 2011).

The researcher tried to review various researches conducted in the area. In fact there are numerous studies conducted by students and few academicians on Addis Ababa Housing Development projects however, almost all of them didn't touch the subject matter the Researcher intends to study. Furthermore, we often hear most projects including Addis Ababa Housing Development Project are not completed on time, quality and budget. Due to shortage of studies on this topic in the specified organization the researcher takes this as an advantage and will try to look the gap in light of the topic under study. Therefore, the present research will attempt to assess the risk management practice in Bole Arabsa housing project.

1.2. Statement of the Problem

A construction is a process of constructing something by human for one purpose or another. It may be a road, bridge, a dam, a private residence, an airport, a commercial building, etc. According to Wikipedia, construction is a process that consists of the building or assembling of infrastructure. The nature of the construction project lead to risk and uncertainty. Even if projects face risk because of its vital nature it's the only option to proceed. Risk is an uncertain event or condition that, has a positive or a negative effect on at least one project objective. Achieving the objective of a project depends on

sticking to the plan and balancing of the iron triangle (Cost, Time, quality & scope) (Zhou, Zhang, & Wang, 2007).

Success in construction project is indicated by its performance in the achievement of project time, cost, quality, safety and environmental sustainability objectives (Zhou, Zhang, & Wang, 2007). Even though most projects in Ethiopia failed to achieve it and lack of a risk analysis or management has results to most construction companies fail to achieve their plan. Most of mega project conducted in Ethiopia are a construction projects; for instance, the great renaissance dam, Addis Ababa housing project and different road projects. The construction industry toke much of the GNP and in general it has poor cost and schedule performance (Aschalew, 2017).

Housing projects are one of the well-known megaproject constructed in Ethiopia. This projects was implemented in Ethiopia since 2004 G.C. Addis Ababa housing project was one of them. The objective of housing project was to enable the lower and middle income portion of the society buy or acquire a house. The very poor members of society are able to begin to acquire some stability in their lives through the provision of houses recognizing those who live with inhuman and unhygienic conditions and providing support to improve the quality of their life (Addis Zemen News Letter 76th, No.172).

The city administration set up 10 projects offices which are engaged in the housing development. In general, the program intends to reduce poverty, improve life of slums and give access to sanitation and reliable service. The project was ambitious and planned to answer for a round one million people housing demand in a relation to high unemployment and technology transfer. The nature of the project is new for the country this implies bad management practice and project administration. Because of this and other related problem the project did not achieve its targeted objective (Addis Zemen News Letter 76th, No.172).

For a project to be considered successful the project should balance the triple constraints; quality, time, cost and scope. If the project fails to attain one of the three, we can conclude that the project is a failed to achieve its objective or goal (Zhou, Zhang, & Wang, 2007). Bole Arabsa housing project is one of the housing project implemented in Addis Ababa. It has five projects and 439 blocks. Projects included in Bole Arabsa site are project 13, Yeka project, Kerkos project, Lideta project and Bole project. Bole Arabas project faced all the tree type of risks (cost risk, performance risk and schedule risk) (site journals).

Bole Arabsa housing project have been overwhelmed by cost and schedule overruns. The final project cost has been higher than the estimated costs of projects prepared and released budgets. In the above case the budget of the project was 6.1 and 7.1-7.6 million birr for G+4 and G+7 respectively. But in the case the budgeted cost varied by 26% resulted from such as inflation in the country economy that leads to rising labor costs, rising costs of raw materials, components and transport costs and because of change in the design of buildings in which the demand of the studio will increase which will not deliberate in the previous design. Cost variation in G+4 and G+7 building is 1,586,000 birr and 1,976,000 birr respectively. Without considering inflation and 100,000 birr finishing cost for the reaming uncovered works (site journals).

Comparison of round 13 condominium transfer price per one square meter with the previous 12 round transfer rate increase from 4,200 birr to 6,900 birr increased by 2,700 birr. The implication of this in a two bed room condominium house 80 square meter area the cost variation will be 216,000 birr. Finally adding 100,000 birr for finishing work; it becomes 316,000 birr. For 80 square meter area building the cost variation is around 316,000 birr (Yonas, 2019).

As Luu, et al, (2009), in developing countries the one cause of losses in finance on project stakeholders is the schedule delays on construction projects. As the scheduled time of the project overrun the cost of the project will have increased because of the inflation in the economy. In Bole Arabsa housing project the scheduled time for the completion of project was 1 and half year for G+4 and 2 years for G+7 buildings. But it has been 6 years and only 76% of the work is completed. Design change and termination of contracts cause delay and cost overrun ion the project.

If the project continue in this pace will take 7 and half year to complete the project. This mean the project schedule variation become 5 and half year for G+7 buildings. On the other hand, for G+4 buildings schedule variation will be 5 years (site journals).

In every product, service, program or projects the goal is to meet the required value for the stakeholders. But in many housing projects of Addis Ababa there are so many project performance problems starting from the poorly defined scope, design errors, unknown site conditions, poorly written contracts, unexpected increase in material costs and poor project management which leads the project to poor standard constructions (Muhammed, et al, 2017).

Quality is an essential component for sustainability and customer satisfaction while unskilled workmanship, inferior of quality materials, and poor profession of project management and leadership have contributed to the housing project problems. Lack of coordination and communication between project stakeholders, lack of commitment and sense of ownerships are the major common bottlenecks of the project stakeholders. In addition to this lack of experienced contractors also identified as a contractor related factors that affected the performance of projects. Moreover, the headache of the project beneficiary were improper transfer of uncompleted condominium house to individuals. Individuals spent one hundred thousand birr on average for finishing work (Guesh, 2017).

Bole Arabsa housing project performance is not different from most housing projects constructed in Addis Ababa. The project lacks finishing work, site work, quality of civil and building system work. Materials used for construction and components used are not in the required level. For instance; Partition wall, ceiling and door is made of agro stone which results poor performance as a non-structural part and it gives bad or non-appealing aesthetical appearance to the building.

Generally, most of a condominium project has been failed to achieve prior listed problems. In addition to this the main objective of the project was not achieved because of different reasons; for instance, the project fails to deliver low cost housing unit. Down payment is very high because of this most lottery winners could not afford it and this lead them to high interest rate for bank. On the other side the lottery winners expect to finish the remaining work that cost around 100,000 eth birr.

This study looked it from the side of the organization in terms of risk management practice which is one of the main factor for poor quality, cost and schedule overrun. Project risk management can help to successfully bring the project to completion. project stakeholders i.e. project managers, project team and sponsors may be interested to understand this linkage for example of what are the risk management process (Risk planning, Risk identification, Risk analysis, Risk response planning & Control risks) with the relative contribution of each of the techniques of risk management and especially risk response plans and how they impact on success of the project in terms of meeting the planned project duration. Within mind this study described the practice of risk management in Bole Arabsa.

Assessing the risk management practice of the site results to determine and take corrective action in relation to any encounters of risk that the project faces and other related projects as well. In addition to this different stakeholders could take lesson form this project for instance the client (Addis Ababa city administration housing bureau, contractors and consultants).

1.3. Research Question

i. How risk management is practiced in Bole Arabsa housing project?
ii. How risk management plan is applied?
iii. How the risks that are identified are analyzed in the projects?
iv. What are the risk response strategies taken?
v. How monitoring and controlling is Applied in the project?

1.4. Objectives of the Study

1.4.1. General Objective

The general objective of this study is to assess the risk management practice in Bole Arabsa housing project. It focuses on understanding and identification of overall risk management practice in the project and prediction of possible action to reduce the negative impact.

1.4.2. Specific Objectives

The specific objectives are:

- To assess existing risk management practice in Bole Arabsa housing project
- To identify if there is risk management plan in the projects
- To assess how the risks that are identified are analyzed in the projects
- To examine risk response or measures
- To identify if monitoring and controlling mechanism is applied in the projects (if there is any deviation)

1.5 Scope of the Study

The scope of this research is the construction project conducted by Addis Ababa Housing Corporation at Bole Arabsa. The research investigated risk management at the construction (implementation) stage and not during the other construction phase. The research measured cost risk, performance risk and schedule risk in the project. The respondents were the professionals who are working in Bole Arabsa site and different stakeholder in the Ethiopian construction industry.

1.6 Limitation of the Study

Biased response of respondent in providing honest feedback even though their anonymity was guaranteed and furthermore they felt that negative responses reflect on their abilities in managing Projects and not on factors beyond their control.

In Mar 13, 2020 G.C, The Federal Ministry of Health has confirmed a coronavirus disease (COVID-19) case in Addis Ababa, Ethiopia. Because of the outbreak of covid-19 most organizations are working with the minimum or limited human resource this implies negative accusation of information. This lead to limitation of information from government or non-governmental office as well.

1.7 Significance of the Study

Addis Ababa City Administration conduct different project with various scale in terms of cost, time, quality and scope so such type of research paper will give the city administration bureau a chance to see the way of doing projects to take corrective action.

For any investigator who conduct research on related topics use this research paper as a secondary as well as primer data.

This paper will provide information regarding risk management practice in a construction project and specifically on risk related to building construction sector.

1.8 Organization of the Thesis

The study composed of five chapters. The first chapter deals with the introductory part. Chapter two is the related literature where detailed discussion about the topic undertaken. The third chapter presented the research design and methodology. In the fourth chapter data presentation, analysis and interpretation were discussed. The fifth and the final chapter covered the summary of major findings and conclusions drawn from the findings and also the possible recommendations were forwarded by the researcher.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the findings from different reviewed literatures on the subjects of construction project, risk and risk management. Risk in construction has been the object of attention because of time, performance and cost overruns associated with construction projects. The risk facing to housing projects and other type of building construction depends on the type and methods of construction, the stage of construction and complexity etc. similarly the risk management technique that should be applied also depends on the above factors. Hence, the literature review tried to highlight these issues in relation to risk with the main focus being on management of construction risk in the project implementation stage. In addition to that the section include literature concerning theories of decision making under uncertainty, some of the risks faced in the construction industry, some risk analysis techniques and risk response practices. The chapter further reviews literature related to the independent and dependent variables in the research.

2.2.1 Project

In many articles, book and journals the term project has been addressed and elaborated in depth. In this paper the researcher disuse some of the basic definition.

According to PMI defines a project as "a temporary endeavor undertaken to produce a unique product, service, or result" (PMI Guide, 2008). The term temporary referee to specified starting and ending time to complete the work. As J. M. Juran, a project as a problem scheduled for solution. Every project are results of need or problem; and projects are a tool to overcome the problem.

2.2.2 Certainty, Risk, and Uncertainty

Decision-making falls into three categories: certainty, risk, and uncertainty. Decision-making under certainty is the easiest case to work with. With certainty, we assume that all of the necessary information is available to assist us in making the right decision, and we can predict the outcome with a high level of confidence (Kerzner, 2001).

Decisions should be made when it has a predictable outcome. Condition where all factors that influences the result and the outcome. However, decision-making often happens under conditions of risk and uncertainty. None of the construction work were free from risk or uncertainty. In any condition decision is made under consideration of risk and when the decision makers have an alternative solution or rational for it. The person uses his or her personal experience to handle the specific event or occurrence. (Ceric, 2003).

Expected value model/theory was one of the first theories of decision-making under risk and uncertainty. The expected value model did not consider the fact that the value that a particular payoff held for one person was not directly related to its precise monetary worth (Tversky & Kahneman, 1997). Rather its show no relation between monetary worth of a spent to result or expected outcome of the project.

Bernoulli introduced the concept of systematic bias in decision-making. Bernoulli assumed that people tried to maximize their utility and not their expected value (Tversky & Kahneman, 1979). Bernoulli's Hypothesis states a person accepts risk not only on the basis of possible losses or gains, but also based upon the utility gained from the risky action itself. Construction industry took most of the country GDP this makes it vulnerable to risk than other industries.

Prospect theory is designed to explain a common configuration of choice and it is having descriptive and empirical nature. Prospect Theory looks at two parts of decision making: the editing, or framing, phase, and the evaluation phase (Tversky, 1967). Framing refers to the way in which a choice, or an option can be affected by the order or manner in which it is presented to a decision maker. The evaluation phase of a prospect theory encompasses two parts, the value function and the weighting function. This theory starts with the concept of loss aversion and risk aversion; Loss aversion is the tendency to prefer avoiding losses to acquiring equivalent gains. The principle is prominent in the domain of economics. What distinguishes loss aversion from risk aversion is that the utility of a monetary payoff depends on what was previously experienced or was expected to happen. The value function is defined in terms of gains and losses relative to the reference point not in terms of absolute wealth. In prospect theory, value is a function of change with a focus on the starting point so that the change is either negative or positive.

Risk is an external factor that affect a given economy or finance positively or negatively, physical damage or injury or delay as a consequence of the uncertainty associated with pursuing a certain cause of action (Chapman, 1983). Many scholars have defined risk: Wideman (1986), Godfrey (1996) Kliem and Ludin (1997) and Smith (1999). Most definitions agreed as a probability of occurrence of events mostly a negative impact on the goal or objective of the project. In mathematics, probability of an event is expressed statistically using the mean, dispersion, confidence interval and other statistical parameters. To run statistical analysis sufficiently relevant data must be available. When the absence of data happens assessing the probability of events will depend on the experience and knowledge of the decision maker.

Risk or uncertainty is an event or condition that, has a positive or a negative effect on at least one project objective. The impact of a risk in construction project were in terms of cost (expense), project schedule and quality (performance). Quality, cost and time are the three iron tringle of any project. Any of the three fails it will have negative effect not only on its self but also in other quadrant. Risk management is the process that, when carried out, ensures that all that can be done will be done to achieve the objective of the project, within the constraints of the project (Clark, Pledger and Needler, 1990). Risk management it’s the application of Knowledge, skill, tool and technique to project activates to meet

project objective using planning for risk, identifying risks, analyzing risks, developing risk response strategies, and monitoring and controlling risks to determine how they have changed (Kerzner, 2009). Different mechanisms and systems has been used by to overcome and reduce the effect of risk in a project and contingency amount or reserve has one of them. Hamburger (1990) and Murray et al (1983) have discussed the use of project reserves and contingency amounts as risk management strategies in construction projects. The contingency reserve amount is often an arbitrary figure of 10% to 20% of the estimated contract cost and project duration. The nature of a project is being unique even if the type of the project were similar. However contingency system or approach does not take into consideration the specific features of each project and it's difficult to consider it as risk management.

2.2.3 Project Risk Management Processes

According to PMI (2013) Project Risk Management processes has six steps. These are, Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses and Monitor and Control Risks.

2.2.3.1 Plan Risk Management

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. 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).

According to PMI (2013), the Inputs that can be used to plan risk management are the project management plan, project charter, stakeholder register, enterprise environmental factors and organizational process assets. The tools and techniques that can be used to plan risk management are analytical techniques, expert judgment and meetings. The output of the risk management planning process is the risk management plan.

2.2.3.2 Identify Risks

According to PMI (2013) 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.

The risk identification process normally considers the product description, scope, WBS, planning documents, historical information, and industry information to determine sources of risk, potential risk events, and risk symptoms (Brandon, 2006).

Any source of information that allows recognition of a potential problem can be used for risk identification. These include: Systems engineering documentation, Life-cycle cost analysis, Plan/WBS

decomposition, Schedule analysis, Baseline cost estimates, Requirements documents, Lessons learned files, Assumption analysis, Trade studies/analyses, Technical performance measurement (TPM) planning/analysis, Models (influence diagrams), Decision drivers, Brainstorming, Expert judgment (Kerzner, 2001).

According to PM (2013) the input for risk identification are Risk management plan, Cost management plan, Schedule management Plan, Quality management plan, Human resource management plan, Scope baseline, Activity cost estimates, Activity duration Estimates, Stakeholder register, Project documents, Procurement documents, Enterprise environmental Factors, Organizational process assets. The tools and techniques are Documentation reviews, Information gathering Techniques, Checklist analysis, Assumptions analysis, Diagramming techniques, SWOT analysis & Expert judgment. The output is a risk register.

2.2.3.3 Risk Analysis

According to Heerkens (2002), Risk Analysis is about determining which threats are of greatest concern. This will be done by using the knowledge gained through risk assessment to determine which potential problems represent the greatest danger to achieving a successful and predictable project outcome, ordinarily by considering the probability that a specific problem will occur and its anticipated impact on the project.

2.2.3.3.1 Perform Qualitative Risk Analysis

Performing 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. Where these risk approaches introduce bias into the assessment of identified risks, attention should be paid to identifying bias and correcting for it. (PMI, 2013).

The inputs for perform Qualitative Risk Analysis are Risk management plan Scope baseline, Risk register, Enterprise environmental Factors and Organizational process assets. The tools and techniques for perform qualitative risk analysis are Risk probability and impact assessment, Probability and impact matrix, Risk data quality assessment, Risk categorization, Risk urgency assessment & Expert judgment. The output for perform Qualitative Risk Analysis are Project documents updates. (PMI, 2013).

2.2.3.3.2 Perform Quantitative Risk Analysis

Perform Quantitative Risk Analysis is the process of numerically analyzing the effect of identified risks on overall project objectives. The key benefit of this process is that it produces quantitative risk information to support decision making in order to reduce project uncertainty. The input for Perform Quantitative Risk Analysis are Risk management plan, Cost management plan, Schedule management Plan, Risk register, Enterprise environmental Factors & Organizational process assets. The tools and techniques for Perform Quantitative Risk Analysis are Data gathering and Representation techniques, Quantitative risk analysis and modeling techniques & Expert judgment. The output for Perform Quantitative Risk Analysis is Project documents updates (PMI, 2013).

2.2.3.4 Plan Risk Responses

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. The inputs for Plan Risk Responses are Risk management plan & Risk register. The tools and techniques for Plan Risk Responses are Strategies for negative risks or threats, Strategies for positive risks or opportunities, Contingent response strategies & Expert judgment. The outputs of Plan Risk Responses are Project management plan updates & Project documents updates (PMI, 2013).

2.2.3.5 Control Risks

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. The inputs for Control Risks are Project management plan, Risk register, Work performance data & Work performance reports. The tools and techniques for Control Risks are Risk reassessment, Risk audits, Variance and trend Analysis, Technical performance Measurement, Reserve analysis and Meetings. The outputs of Control Risks are Work performance Information, Change requests, Project management plan updates, Project documents updates and Organizational process assets updates (PMI, 2013).

2.3 Risk Assessment

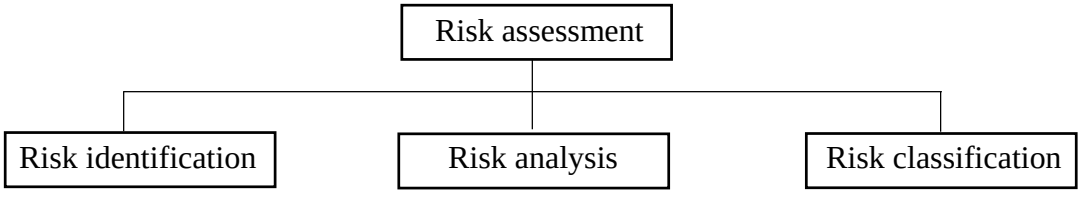
Risk Assessment is the process of evaluating the risk resulting from a hazard or it’s an important process that many consider critical to ensuring the health of a program. A risk assessment process is undoubtedly critical and is generally considered to be the foundation of an effective compliance and accomplishment of a program.

According to Canadian service department; risk assessment is a term used to describe the overall process or method and its identification of hazards and risk factors that have the potential to cause harm (hazard identification). Analyze and evaluate the risk associated with that hazard (risk analysis, and risk evaluation) and it determines appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control).

2.3.1 Models of Risk Assessment

The OCC 2011-12 Bulletin defines a model as "a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques and assumptions to process input data into quantitative estimates". The key descriptor in this definition is the word "quantitative," which is the critical component to classifying something as a model. Models are inherently quantitative whereas risk assessments are not. To restate the definition, providing additional emphasis, a model is a quantitative method, quantitative system, or quantitative approach transforming data inputs (whether quantitative inputs or qualitative inputs) into quantitatively-estimated outputs.

Researchers in the literature proposed various risk management strategies that should be implemented to tackle those risks. Risk management consists of two main steps: risk assessment and risk control. It has three subsidiary units: risk identification, risk analysis and risk classification and prioritization. The most popular and applicable risk assessment models available in the literature. Researcher come up with a taxonomy in which those models can be categorized as: Artificial Intelligence (AI) based, Classical (or Non-AI based), and other Hybrid models.



(Taher.G et al, 2014)

Figure 2. 1: Risk assessment tree

A. Classical Models (Non-AI based Models)

1) Risk Assessment based on Questionnaire: Williams et al, proposed a model for assessing risks which is a Taxonomy Questionnaire. They prepared a set of questions, and then they provide some answers to those questions. They compute the risk levels of each risk element to predict the possible outcomes of software projects accurately. Later on, in 2000, Foo and Murganantham proposed a risk assessment model, named SRAM (software risk assessment model), for software projects with the use of a predefined questionnaire. By considering nine risk factors, they developed a comprehensive questionnaire which contains a set of questions for each risk factor. The questionnaire was given to experts who are specialized in the risk assessment field. Finally, their model was tested based on historical data and it was observed that their model was able to predict the outcomes of software projects.

2) Risk Assessment and Estimation Based on Software Metrics: In order to assess risks that might occur in a project, Hyatt and Rosenberg, introduced software metrics for assessing project risks. They defined specific quality attributes and goals based on their importance in developing software projects and their capability to be quantified. A core set of metrics was defined which relate to the software development process and products. Several measurements for metrics' usability and applicability were discussed. Gupta and Sadiq presented SRAEM, which also provide software metrics with risk exposure for software risk assessment and estimation. In addition to the total cumulative risk, the proposed model has the ability of identifying the set of risks from each phase in the project development. The model estimates the source of ambiguity and uncertainty using errors. Sadiq et al, introduced SRAEP, Software Risk Assessment and Evaluation Process. SRAEP is based on a model based approach associated with the fault tree approach. These two approaches were used to identify the project risks.

3) Risk Assessment Models Based on Classification and Prioritization: Qualitative and quantitative risk assessment of software projects was founded by Boehm (1991). This model cannot classify the risk events based on their statistical (in) dependence. Instead, it can do so by using the decision tree to help in risk event classification based on their dependence. After Boehm's work, Fairley (1994), recognize the statistical dependence of the risk events by taking into account some attributes in which risk events are related, such as size, time, etc. In 2011, Uzzafer proposed a novel risk assessment model for classifying risk events of software projects qualitatively. This is based on their occurrence independence and statistical independence of their impacts. Additionally, it's capable of integration into the software cost estimation model in order to enhance its ability of generating cost estimates with the associated impacts of the project risk events.

4) Risk Assessment Based on Estimation Tools: in 2000, Keshlaf and Hashim developed a Soft Risk which is a prototype tool for managing software risks. The design of this tool is based on a model proposed in the same paper called SERIM, Software Engineering risk model. This model focuses on technical, cost, and schedule risks. The problem with this model is that it does not consider the requirements and complexity issues. In 2010, Sadiq et al. introduced a new architectural implementation using their proposed esrc Tool. This tool is based on SRAEM (2008) model. It is useful for two purposes: estimating the risk in the software, which what we focus on in this survey, and the other one is to estimate the cost of the software. They have applied the function point approach as an input parameter into the esrc Tool.

B. Artificial Intelligence based Models

1) Artificial Neural Networks based (ANN): Artificial Neural Networks (ANN) approach is a machine learning technique that has learning abilities and it is helpful in solving problems with uncertain and poorly understood conditions. It can help humans in designing effective algorithms. ANN is constructed from a neuron processing element. Processing elements are connected by a network of connections where each connection is weighted and it builds the network knowledge. ANNs are used as pattern classifiers and memories. Software engineers have taken the advantage of ANN to identify risk in software development. In 2007 Salvatore et al, Enhanced the existing risk management models by checking out the results of current approaches of risk management. They provide a way to compare historical risk data on the risks identified by similar projects with the risk found by each framework, based on direct queries to the stakeholders. Another study by Goonawardene, et al in 2010, which is to

examine the effectiveness of using neural and fuzzy systems in the areas such as job recruiting, predicting of project success or failure and on decision making based on performance appraisal of employees. Kutlubay, et al in 2005, established a method for identifying software defects using machine learning methods.

2) Bayesian Belief Networks (BBNs): Bayesian Belief Networks represent probabilistic relationships between variables. BBNs enable reasoning under uncertainty and it is possible to articulate expert beliefs about the dependencies between different variables. They propagate the impact of evidence on the probabilities of uncertain outcomes, such as future system reliability (Fenton and Neil, 1999). In 1999 Fenton and Neil have shown that causal models using BBNs have many advantages over the classical approaches. Another study is done by Fenton and Neil in 1999, who proposed a model using BBNs and explained that a very complex problem.

3) Fuzzy Logic Based: Software project risk assessment is not always just a matter of win or lose, most of the time, it is necessary to give some degree of hazard assessment to each identified risk. That's why we need fuzzy logic to give degrees to these risks. The fuzzy logic technique is used when we want to convert linguistic variables into numeric values between 0 and 1 according to an expert inference system. Many project risk assessment and identification models used this technique to assess risks in new software projects. In 2009 Li, et al, introduced a model based on the fuzzy linguistic multiple attribute decision making. In this model, a group of experts give an assessment value of each risk assessment object based on predefined risk assessment criteria and set of linguistic terms. Then a triangular fuzzy number can be given for each linguistic assessment element that will formulate an assessment matrix for each expert assessment. From those formulations, a new estimated value of the previous triangular fuzzy numbers is calculated and sorted to give priority to the risks. In 2009 Iranmanesh, et al, a new risk assessment approach is proposed using Fuzzy Inference system. This approach uses Schmidt risk factors as the basis for risk assessment system.

C. Hybrid Models

A hybrid method which integrates software metrics with questionnaires (Deursen & Kuipers, 2003). This method focuses on primary facts which are obtained by analyzing, automatically, the source code of a software with code metrics. A project risk evaluation model using Neural Network (NN), support vector machine (SVM), and also genetic algorithm approaches (Hu, et al, 2007). Several software risk factors are gathered from 30 experts and applied as an input to their model. They experimented their model on data collected via questionnaires, and found that SVM produced better results than NN. Accordingly, their neural network model is optimized by a genetic algorithm, to have a model that outperformed SVM in performance.

2.3.2 Risk Identification and Management

Risk management is one of the nine knowledge areas propagated by the Project Management Institute (PMI). The PMI Guide recognizes nine knowledge areas typical of almost all projects. Each PMI knowledge area in itself contains some or all of the project management processes. Risk and uncertainty management is of the PMI knowledge area and it's a difficult aspect of project management. The role of project manager in a project is crucial in recognizing, understanding and finding the right path to

uncover the risk. Risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives (PMI, 2008; ICE, 2005).

The construction industry involves different disciplines or professional and it's a team work; this makes it complex and challenging. The major classifications of construction works are: housing, non-residential building, heavy, highway, utility, and industrial (Clough, et al., 2005). Projects could be divided based on time frame of workmanship: construction of new project or renovation project and rehabilitation of existing infrastructure facilities. Most construction work in Ethiopia involves new public and private infrastructure projects like housing projects, large dam projects and road projects. Large construction projects are exposed to risks and uncertainty. The problem comes from bad planning, design and construction complexity, many players, use of many resources and their availability, unpredictable environmental factors, the continuously changing economic and political environment, and statutory regulations.

The risk analysis and management techniques have been described in detail by many authors (Ahmed, 2007, Cretu, 2011; Adrienne, 2019). The most common type risk management process includes risk identification; risk assessment; risk mitigation; and risk monitoring. Risk identification process attempts to identify the source and type of risks. Risk identification involves the recognition of potential risk event conditions in the construction project and the clarification of risk responsibilities (Wang, Dulaimi, & Aguria, 2004). Risk identification is a key point to uncover the risk by means of analysis, control and management. The identification and mitigation of project risks are vital steps in handling fruitful projects (Carbone & Tippet, 2004). Risk identification is the process of determining risk that may affect the project and assessing the impact of the risk should it occur. This information is documented in the risk register, a list of all the identified risks, their root causes, category and responses (FME, 2014).

2.3.3 Project Risk Analysis

Risk analysis is the second step in the process of risk assessment. This is the systematic use of available information to determine how often specified events may occur and the magnitude of their consequences, which may use any of a wide variety of mathematical and other models and techniques (Cooper et al., 2005). To analyze an identified risk qualitative and quantitative methods could be used. Furthermore, semi-quantitative approach could be used to analyze the scenario by combining numerical value with qualitative analysis with description of risk factors called semi-qualitative analysis (Mehdizadeh, 2012).

The qualitative risk analysis is the process of reviewing and prioritizing risk events and determining the probability and corresponding impact on project objectives. Qualitative risk analysis assesses the impact of identified risks using their relative probability or likelihood of occurrence, the corresponding impact on objectives if risks occur, as well as other factors such as the time for response and the organizations risk tolerance associated with the project constraints of cost, schedule, scope and quality. Such assessments the attitude of the project team and other stakeholders to risk. It does not directly address

the overall risk to project objectives that result from the combined effect of all risks and their potential interactions with each other, which can be achieved using quantitative risk analysis techniques. The main tools and techniques commonly used for this analysis are risk probability and impact assessment, probability and impact matrix, risk data quality assessment, risk categorization, and expert judgment (PMI Guide, 2013). The qualitative methods are most applicable when risks are positioned on a descriptive scale from low to high level. The main advantage is that it assists in ranking the risks and it specifies areas for immediate action and improvement. Conversely, the disadvantage is that it does not offer specific quantifiable measurements of the magnitude of the impacts (Ward, 1999). Qualitative risk analysis technique doesn't show the risk intensity or impact in a numerically.

Ultimate objective of qualitative risk analysis is to identify the effect of risk or uncertainty on the project objective using the qualitative risk analysis phase. The key benefit of this process is that it produces quantitative risk information to support decision making in order to reduce project uncertainty. Quantitative risk analysis identifies the possible risk coverage related to a project and assists the construction manager in developing suitable and effective responses for risk mitigation. The tools and techniques commonly used for this analysis are sensitivity analysis, expected monetary value analysis, critical path method, probabilistic network evaluation technique, program evaluation and review technique, and Monte Carlo simulation (PMI Guide, 2013). The major advantage of quantitative risk assessment is that it provides a measurement of the magnitude of impacts, which can be used for further analysis. The main disadvantage is that the meaning of the numerical ranges used to express the measurement may be unclear (Boehm, 1991). Qualitative aspect of the risk expressed in numerical value or quantifiable form.

2.3.4 Risk Quantification

Risk quantification is the process of evaluating the risks that have been identified and developing the data that will be needed for making decisions as to what should be done about them. Many projects fail to complete in original cost and time estimates due to inadequate risk quantification. Risk quantification is a process to evaluate identified risks to produce data that can be used in deciding a response to corresponding risks. It is a 2nd step of project risk management, after risk identification and before risk response development and risk response control according to PMI standard. The objective of project risk quantification is to prepare contingencies in terms of costs, time, or human resources and prioritize them. PMI, ISO 31000, and PRINCE2 provide principles and processes for effective risk management. Risks are quantified by using either expert intuitions or statistical tools. Five techniques as proposed by PMI standard for risk quantification have been reviewed in this article. The process of risk quantification is an important step of the risk management process and therefore, important to ensuring the success of a project.

In order to quantify risk, it needs to be identified first. Once risk is identified then it is analyzed in terms of probability of occurrence and impact that it could print on the outcome. The probability is assigned either based on intuition or the previous data of failure rates available for similar events in datasheets. Once probabilities of all events are calculated, a criterion for the likelihood of all the events is defined (ISO 31000). For example, if a specific event may occur in exceptional circumstances, like for example

less than 3% chance of occurrence, then its likelihood can be assigned as “Rare”. In a similar way, severity or consequence of the events on a project is also classified. For example, if an event may result in abandonment of project then it can be classified as “Catastrophic” or if it may result in a delay of 50% of schedule or 50% of additional cost then it may be classified as “Major”. The risk(R) is calculated by multiplying probability (P) with the impact (I) or severity (R= P x I).

Once risks are quantified then these are evaluated against a defined risk criteria or risk matrix (ISO 31000). Red zone in a risk matrix may represent unacceptable risks, yellow zone as an acceptable risk, and green zone as neglect able risks. For example, if an event has a likelihood of class “Likely” and it has a severity class “Catastrophic” then it may lie in the red zone of the risk matrix. This may mean that this risk is not acceptable and appropriate or immediate actions should be applied to lower this risk into the acceptable zone or prepare contingencies. Table 2.1 shows an example of risk matrix of a project. The first column represents criteria for likelihood, whereas, the first row represents criteria for consequence. Further, nature of any possible risk is defined based on both likelihood and consequence from low, moderate, high, to an extreme.

Table 2. 1: Example of risk matrix of a project

Likelyhood	Consequences				
	Insignificant *Risk is easily mitigated by normal day to day process*	**Minor** *Delays up to 10% of Schedule Additional cost up to 10% of Budget*	**Moderate** *Delays up to 30% of Schedule Additional cost up to 30% of Budget*	**Major** *Delays up to 50% of Schedule Additional cost up to 50% of Budget*	**Catastrophic** *Project abandoned*
Certain *>90% chance*	High	High	Extreme	Extreme	Extreme
Likely *50% - 90% chance*	Moderate	High	High	Extreme	Extreme
Moderate *10% - 50% chance*	Low	Moderate	High	Extreme	Extreme
Unlikely *3% - 10% chance*	Low	Low	Moderate	High	Extreme
Rare *<3% chance*	Low	Low	Moderate	High	High

(Matthew.C, 2020)

PMI provides 5 methods that can be used in risk quantification process. These tools and techniques are described briefly below, along with application, advantages, and disadvantages of each tool.

Expert Opinion

A belief or judgment about something given by an expert on the subject”. Expert opinion is one of the risk quantification techniques. In expert opinion, risks are quantified based on the opinions of experts or senior executives based on their experiences (Cavalcanti & Leonardo, 2006). One of the best ways

to use expert opinion is to conduct risk assessments workshops where experts can discuss and consequently assign values to the risks identified. But, this may lead to group bias and can affect the outcome. This bias can be minimized by using Delphi method, but there still be a chance of high variation in opinion. Although, expert opinion is not as concrete, as other methods may be, and may prone to personal subjectivity, but it is a very useful tool for risk quantification when data is scarce or no sufficient past experience is available or where risks are very company or project specific. Figure 4 shows an example of risk quantification using expert opinion in a case study on construction project conducted by Yildiz, et al (2014). Attributes ratings assigned by experts using 1-5 Likert Scale.

Expected Monetary Value (EMV)

Expected monetary value is another way to quantify risk. According to PMI, expected monetary value is a product of two numbers, risk probability value and risk event value which is an estimate of loss or gain that will be incurred if the risk event occurs. These values can be positive and negative resulting in gain or loss respectively. For example, if there is 60% probability that a certain equipment will fail during a project that will result in USD 10,000, then EMV will be USD -6,000.

It can be perceived that a total of USD 4,500 is required as a contingency, but in actual only USD 1,100 are required as all of the events are not going to happen. This means, the risks which are not going to happen will add their value to EMV pool, where risks that are going to happen will utilize value from this pool. Hence, for this example, a project manager can add extra USD 1,100 into project budget as contingency (Tysiak & Alexander, 2009). EMV helps project managers in two ways. First, it helps to manage to estimate the amount required to manage all identified risks. Second, it helps in selecting the choice to manage the risk by selecting the option with the minimum value. EMV is generally used as an input to further analysis, for example, in decision trees. Benefits of using EMV are that it provides help in calculating contingency reserves, in procurement planning decision-making, in spreading the impact of a large number of risks, and in decision tree analysis. Whereas drawbacks of using this technique are that this technique is not used in small and small-medium sized projects, use of expert opinion may result in personal bias, and the chance of forgetting of inclusion of positive risks (Platen & Phrases, 2015).

Statistical Sums

Statistical sums is another way to quantify risks. In this technique cost estimates of individual work items are calculated and then are used to calculate range of total project costs using statistical probability distribution. The range of different project costs can help to quantify relative risks of alternative project budgets (PMI). In this method, instead of using one point estimate, 3 point estimates are used. Cost of each work item is estimated through 3 points of likelihood i.e. low, likely, and high. Then statistical distribution such as normal distribution or beta distribution is used to calculate mean and variance (Duncan, 2013). To calculate mean and variance of total project estimate, means and variances are added together for all work items. It is an easy technique for calculating budget and time contingency of a project, but it cannot be used for unforeseeable risks that may happen during a project. Further, as estimates are provided on expert opinion bases so it may subject to personal bias.

Monte Carlo Analysis or Simulation

Monte Carlo is a computerized mathematical simulation technique that is used to quantify risks in project management (Tysiak & Alexander, 2009). This technique is helpful in seeing the probable outcomes of decisions and assesses the impact of risk that is useful in decision-making. Most likely and least likely estimates of risks are provided for each event and then these estimates are summed together to calculate a range of possible outcomes. Monte Carlo simulation then generates random values between the ranges and calculates the number of occurrences the value lies within each possible outcome (Ahmed, et al, 2003). This probability is then distributed and the decision is made based on the most probable outcome (Platen & Phrases, 2015). For example, if there are three tasks required in an e-learning project. Best case, most likely, and worst case estimates of all the tasks required are given in figure 7. It can be seen that the project is most likely to complete in between 11 and 23 days. Now for example, if Monte Carlo simulation is run 500 times generating random values between 11 and 23. The total number of times the simulation result was less than or equal to projected duration is calculated.

Table 2. 2: Three point estimate of e-learning project

Tasks	Best-case estimate	Most likely estimate	Worst-case estimate
Writing content	4 days	6 days	8 days
Creating graphics	5 days	7 days	9 days
Multimedia integration	2 days	4 days	6 days
Total duration	11 days	17 days	23 days

(quantmleap.com, 2010)

The probability of each projected duration is calculated and distributed as shown in figure 8. It can be seen, from figure 7, that the most likely projected completion time is 17 days. But, as per figure 8, Monte Carlo simulation shows that likelihood of project completion in 17 days is almost 33%. Whereas, the likelihood of project completion in 19 days is 88%. Hence, it can be estimated that the project will most likely complete in 19 to 20 days (Russell & Taylor, 2000).

Monte Carlo simulation is usually used in cost and schedule estimation. It can also be used in large projects or programs. The benefits of using Monte Carlo are easiness of tool, numerical estimation, and greater level of confidence (Clemen & Reilly, 2001). Whereas drawbacks or challenges are the use of right distribution as wrong distribution may lead to wrong results, input estimates as right estimates are required to produce right results, and use of right mathematical formula in the software (Perry & Haynes,1985).

Decision Trees

Decision tree is a tool that uses tree-like graph or model of decisions and their corresponding consequences that can be used to quantify risks and make a decision under uncertainty in a project (Ahmed, et al, 2003). Expected Monetary Value (EMV) is usually used to quantify risks, where probability (P) of an event is multiplied by its impact (I) to calculate the EMV (Clemen & Reilly, 2001). Benefits of using decision tree analysis are ease of understanding and implementation, quantification of even little hard data, and a possibility to add several new scenarios. While disadvantages are biases of input data and increase in complexity for a large number of outcomes that are linked together.

Risk quantification is very important in project management and its importance cannot be overlooked. It helps in quantifying risks and aid in making rational decisions. It also helps in preparing contingencies for cost, time, and human resource estimates. Several national and international standards exist that explain the principles and processes of risk management. All of the standards are based on the same fundamental core concepts and organization can use any of the standards that best suits them. Risk can be quantified using several methods proposed by different standards. These methods can be applied to different projects based on their nature and influencing factors. Although, risk quantification help managers in seeing a quantitative output, but personal subjectivity to probability and impact creates challenges in risk quantification. Nonetheless, risk quantification should be an integral part of decision-making rather than irrational acting on the unforeseeable events.

2.3.5 Risk Mitigation Strategies

Risk mitigation refers to the process of planning and developing methods and options to reduce threats or risks to project objectives. A project team might implement risk mitigation strategies to identify, monitor and evaluate risks and consequences inherent to completing a specific project, such as new product creation. Risk mitigation also includes the actions put into place to deal with issues and effects of those issues regarding a project (Indeed career advice, 2020). Risk mitigation strategies are designed to eliminate, reduce or control the impact of known risks intrinsic with a specified undertaking, prior to any injury or fiasco. With these strategies in place, risks can be foreseen and dealt with.

Risk mitigation is the fourth step in project risk management process. In project risk management process there are seven elements; which includes risk management plan, risk identification, risk evaluation, risk mitigation, contingency plan, risk monitoring & control and project risk by phases. After the risk has been identified and evaluated, the project team develops a risk mitigation plan, which is a plan to reduce the impact of an expected event. The project team mitigates risks in various ways; risk avoidance, risk sharing, risk reduction and risk transfer.

2.3.5.1 Risk Avoidance

Risk avoidance involves developing an alternative strategy that has a higher probability of success but usually at a higher cost associated with accomplishing a project task. A common risk avoidance technique is to use proven and existing technologies rather than adopt new techniques, even though the new techniques may show promise of better performance or lower costs.

Risk avoidance is the elimination or avoidance of some risk, or class of risks, by changing the parameters of the project. It seeks to reconfigure the project such that the risk in question disappears or is reduced to an acceptable value. The nature of the solution may be engineering, technical, financial, political, or whatever else addresses the cause of the risk. However, care should be taken so that avoiding one known risk does not lead to taking on unknown risks of even greater consequence (National Academy of Sciences, 2020).

The avoidance strategy presents the accepted and assumed risks and consequences of a project and presents opportunities for avoiding those accepted risks. Some methods of implementing the avoidance strategy is to plan for risk and then to take steps to avoid it. For example, to mitigate risk on new product production, a project team may decide to implement product testing to avoid the risk of product failure before final production is approved. The following examples are other ways to implement the avoidance strategy (Indeed career advice, 2020).

2.3.5.2 Risk Sharing

It's partnering with others to share responsibility for the risky activities. Many organizations that work on international projects will reduce political, legal, labor, and others risk types associated with international projects by developing a joint venture with a company located in that country.

Risk sharing in business is a way of taking collective responsibility for the outcome of a given investment. Risk sharing by partners in a business enterprise reduces the amount of risk faced by any one party (Kamali, 2013). The greater the number of partners sharing the risk, the lower is the risk facing each partner. Partners can also offer advice to one another on the most effective ways to reduce the risks facing their business enterprise. Consultation should in turn enhance the level of trust among the partners.

When an investor takes on a single equal partner, he reduces his risk by fifty per cent. When three parties share the risk equally, the risk is reduced by two thirds of what a single party would have to bear. The greater the number of parties sharing the risk, the lower will be the risk facing each party. The amount of risk decreases as the number of partners sharing it increases.

Risk is a powerful deterrent. Investors are motivated by a hope of profits and restrained by the risks of losses (Kamali, 2013). Thus, sharing risks promotes a balanced approach to investment. The possibility (risk) of suffering losses acts as a powerful incentive to investors to allocate resources wisely. Where investors feel there is little or no risk, they are more likely to commit resources on a scale greater than what is justified by a more accurate assessment of risks and the prospects of returns. Risk constitutes an important incentive for exercising due diligence, a sine qua non of an efficient allocation of capital.

2.3.5.3 Risk Acceptance

Accepting risk, or risk acceptance, occurs when a business or individual acknowledges that the potential loss from a risk is not great enough to warrant spending money to avoid it. Also known as "risk retention," it is an aspect of risk management commonly found in the business or investment fields (Investopedia, 2020).

Some risks may be accepted: in some cases, it is cheaper to leave an asset unprotected due to a specific risk, rather than make the effort (and spend the money) required to protect it. This cannot be an ignorant

decision: the risk must be considered, and all options must be considered before accepting the risk (Conrad, et al, 2014).

2.3.5.4 Risk Reduction

Risk reduction is an investment of funds to reduce the risk on a project. On international projects, companies will often purchase the guarantee of a currency rate to reduce the risk associated with fluctuations in the currency exchange rate. A project manager may hire an expert to review the technical plans or the cost estimate on a project to increase the confidence in that plan and reduce the project risk. Assigning highly skilled project personnel to manage the high-risk activities is another risk reduction method.

Risk reduction is a risk management technique that involves reducing the financial consequences of a loss. This encompasses a whole range of things including reducing the severity of a loss, reducing its frequency, or making it less likely to occur overall (Insuranceopedia, 2020).

There are a number of ways that an insurance company can practice risk reduction. For instance the insurance company may require the owner of a property covered for theft and vandalism to install a better security system. These preventative measures will serve as a warning to would-be criminals and decrease the likelihood of a loss occurring. This lowers the probability of the insurance company having to pay for losses. If a client is covered for fire, their insurer might also suggest replacing materials that are no longer fireproof or to install sprinklers and smoke detectors on-premises. These steps will not necessarily prevent a fire from starting but will go a long way to reduce the financial loss caused by the fire (Insuranceopedia, 2020).

2.3.5.5 Risk Transfer

Risk Transfer is a risk reduction method that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk-transfer method. The risk is transferred from the project to the insurance company. Example-A construction project in the Caribbean may purchase hurricane insurance that would cover the cost of a hurricane damaging the construction site.

Also Weather, political unrest, and labor strikes are examples of events that can significantly impact the project and that are outside the control of the project team. Risk transfer can be entirely appropriate when both sides fully understand the risks compared to the rewards. This strategy may be applied to contractors, sureties, or insurance firms. The party that assumes the risk does so because it has knowledge, skills, or other attributes that will reduce the risk. It is then equitable and economically efficient to transfer the risks, as each party believes itself to be better off after the exchange than before and the net project value is increased by the risk transfer (National Academy of Sciences, 2020).

2.3.6 Conceptual Framework

The conceptual framework for this study is derived from the literature review that has identified the key risks at execution or implementation stage and suggested risk management practices. Model for work

flow for the study; shows the probability from the feeding data to identify the critical attributes among all the risk management practices in the project in relation to the project performance. Then data is presents using pie charts and tables are selected for data presentation to show the probability of occurrence and its impact of risk factors.

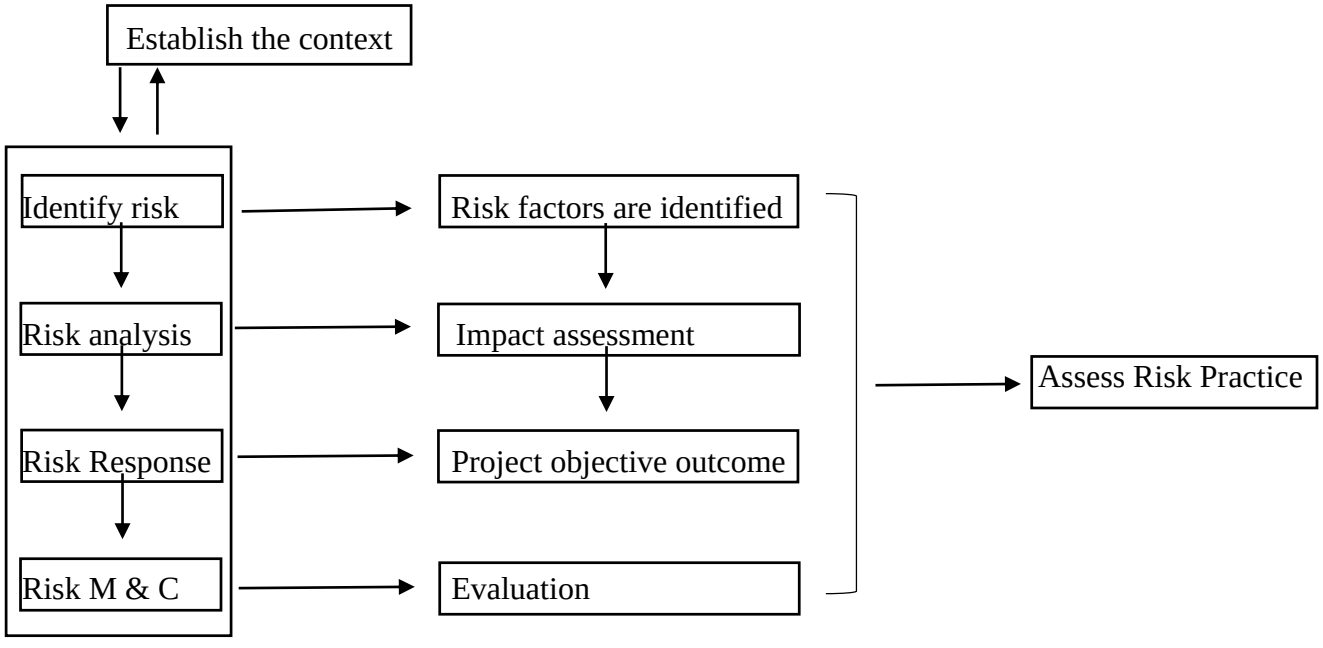


Figure 2. 2: Conceptual framework

2.4 Empirical Review

In this section the researcher review literature related to the research problem and both the independent and dependent variables.

2.4.1 Risk Assessment

Risk is perceived as a negative term, even though in theory it can have two dimensions. Professionals in the construction industry are using techniques described in the literature concerning RM, but are not aware of it. Risks are being managed every day in the industry, but not in such a structured way as the literature describes. The knowledge of RM is close to zero, even though the concept of risk management is becoming more popular in the construction sector (Ewelina & Mikaela, 2011).

The construction companies need to include risk as an integral part of their project management. Decision making such as risk assessment in construction projects is very important in the construction management. The identification and assessment of project risk are the critical procedures for projecting success. The hierarchy is as follows Technology, Management, Procurement, Environmental, Financial, Construction, Subcontractor, Political and Design Risks (Shankar & Balasubramanian, 2015).

Contractors are one of the main stakeholder in the construction industry. Most contractures are punctual and capable of what they do but there are cases that this might be true. In this case the main contractor contributes the highest risk of construction schedule delays for Nuclear power plant (NPP), followed by utility in second place, regulatory authority in third place, and financial and country factor in fourth place. The results show that the six most important sub-factors in the high risk zone according to the risk matrix are as follows: “delayed regulatory approval”, “country factor”, “inadequate completion of design before start of construction”, “slow procurement, manufacturing of equipment and delivery to the site for installation”, “delayed progress of construction and commissioning related works”, and “financial matters” (Muhammed, et al, 2015).

The members of the project team were not identifying risk in a structured way as described in the literature. They believed that their time was used more efficiently when they worked on the actual project instead of searching for problems. Only to a small extent were risks in the project identified by experience. Moreover, a number of risks which are characteristic for a construction project can be gathered in the form of a checklist and be used in future projects (Ewelina & Mikaela, 2011).

This tool, discussion, brainstorming and using previous experience, was used by the project team at the kick-off meeting, where one of the activities was to identify potential threats to the project. At the meeting, all actors taking part in the initial stage of the project were present. Even though RM was not used in the investigated project, such a meeting could be classified as a part of RMP. By organizing such meetings, parties were given a chance to discuss and identify potential problems (Ewelina & Mikaela, 2011).

The findings of the study revealed that there is no well-organized policy or guideline that recommend how to manage risks in the projects. The project doesn’t usually follows a defined or standard risk management process. Majority of respondents believed risk management is not treated as a continuous process in the project. The finding of the result showed irregularity as far as handling of uncertainties that occur within the project (Mohammed, 2018).

There is no systematic approach or a careful planning done to perform risk management in the project. Even though the representation of relevant stakeholder was not worst, their involvement was not sufficient enough. Majority of the respondents believe that expert judgment or meetings is not considered while planning of risks (Mohammed, 2018).

Team members do not play a role in identifying risks. Enterprise doesn’t use the available method of risk identification adequately. The majority of source of risk in the project is human risk followed by technical and financial risks (Mohammed, 2018).

The Enterprise doesn’t consider the characteristics of risks in to account before analyzing the identified risk. On the contrary, there is a measurement system within the Enterprise to analyze the risk. Updating of project document once assessment of risk is done has been an area of concern for the Enterprise. As far as technique used in assessing the probability of risks, the Enterprise is doing well in subjective

probability assessment based on expert judgment but showed poor in using other techniques (Mohammed, 2018).

2.5 Research Gap

It is apparent from the literature review that there is no common view of risks among the different players in construction projects. The value of systematic risk management of project activity is not fully recognized by the construction industry (Walewski, Gibson, & Vine, 2002). Since no common view of risk exists, owners, investors, designers, and constructors have differing objectives and adverse relationships between the parties are common.

The literature review shows that most researchers have focused on different techniques for risk management and the role of risk management in construction projects. While most literature acknowledge that risk management is a process. Most literature approaches the construction process as an organized and standardized production process like manufacturing. However the construction process often has special features for every project that burden the process and makes changes leading to process improvement difficult.

While the construction industry continues to mechanize, the fact that a lot of work is still manual makes change and process improvement slow compared to other industries. Many players in the construction industry bring many risks. While many scholars appreciate this source of risk, there is no theory on how to ensure that the construction process is well integrated. There is need to integrate the separate operations and interests of the client, the designers and the contractors and suppliers to ensure unwavering commitment to the success of the project.

Despite the availabilities of different literature on risk management in construction industry, delays and cost overrun remain an everyday event in most projects. Therefore the need for additional research to develop a better understanding of what effective risk management is required in construction industry. This research aims to contribute to this knowledge and with an emphasis on Ethiopian construction industry.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter investigates the most appropriate research methods, data sources, sampling techniques, data collection instruments and procedures, and data analysis methods while undertaking the study will be discussed briefly as follow.

3.2 Research Design and Approach

In this study descriptive research design was used. It describes particular phenomenon, focusing upon the issue of what is happening, or how much of it has happened, rather than why it is happening. Primary data collected through structured five point Likert scale questioner, ranging from strongly agree to strongly disagree with regard to the various statement that measured the variable. The research attempts to answer the question of what risk management practices in Bole Arabsa housing project. This design was particularly important for the study because it helps to describe and assess interpret the performance of the site in relation to the risk the project encounter.

The research used both qualitative and quantitative methods. Quantitative research involves analysis of quantifiable or statistical data that is often measurable and it's based on some quantitative measurement of characteristics. To extract relevant quantitative data from the project both open ended and closed ended questioners was used. The questioners prepared in eight sections. A Qualitative research designed to find out how people feel or what they think about a particular subject or institution. It is concerned with qualitative phenomena. As a qualitative data Site diary or journals and documentations were collected from the project site. Using both qualitative and quantitative methods give a chance to study the practices and describe the practice of project risk management at Bole Arabsa housing project.

3.3 Data Sources and Collection Methods

The research used questionnaire as a data collection approaches. The research sample for the questionnaire was selected on a purposive basis, according to the judgment of the researcher as to who could provide the best information to achieve the objectives of the study (Kumar, 2005). The research sample encompassed of construction industry workers; drawn from professionals and workers who are involved in the project (Bole Arabsa) and other stockholders of the project.

The study was designed to obtain views from consulting architects, project managers, engineers, quantity surveyors and contractors in regard to risk management practices in Bole Arabsa housing project. The target populations interviewed or surveyed were related to a Bole Arabsa project. The survey obtained recollections of exact field experiences.

3.4 Data Sources

Data was collected both by primary and secondary data collection method. Primary data was gathered from Bole Arabsa construction site through questionnaire. Employee of the three stakeholders' which is client (city government of A.A housing development and administration bureau housing development Corporation), contracture (50 contractors) and consultant (MGM consulting plc & SG consulting plc)

were requested to fill the designed open and close ended questionnaire. Lower level worker view also considered in the research because of their day to day connection to the project. In addition to this data collected from the project sit, for example project journals and recorded documents were used.

As a secondary data source various published and unpublished related literatures, performance management system policy and procedure of risk on construction and organizational booklet were reviewed to get different data about the study and it is used as a secondary data sources.

3.5 Population and Sampling

The population of the study comprised of all engineers and project managers who are working in Bole Arabsa condominium site. In the project there were 732 engineers (architects, civil engineers, sanitary engineers, electrical engineers, site engineers, site inspectors, Forman's & quantity supervisors) and project managers gives a total of seven hundred thirty-two engineers. The clients in the project is city government of A.A housing development and administration bureau housing development Corporation. All engineers listed above are from the three parties 372 from contractors, 300 from consultant and 60 from client.

The sampling frame included the list of engineers and Architects involved in the project and who are aware of the project detail. The sample for questioner were engineers who work for clients, consultants and contractors as an employee.

Purposive sampling is a useful sampling method, which allows a researcher to get information from a sample of the population that one thinks knows most about the subject matter (Walliman, 2011).

Using Yamane (1967:888) $n=N/1+N\ (e)^{2}$
$n = 732/1+732(0.05)^2$
n=259

Where N is the population size; n is the Sample size; and e is the level of precision (Yamane, 1967). A precision level of 5% was assumed for random sampling survey; the sample size was 259.

3.6 Data Collection Methods

From the available methods in collecting data three methods were adopted. These were literature review and questionnaires. Literature was reviewed to establish what others have documented on the subject matter. Useful information was collected from books, governmental and non-governmental web sites, papers, journal papers and Internet sources. Questionnaires were used to gather information for the study. The questionnaires were both online (for the top management and supervisors) and hand delivered for those of lower positioned staff (this only COVID-19 pandemic get solution). Due diligence was done to ensure that the respondents in the study comprised at least 95% of the total respondents.

3.7 Sampling Technique

As the numbers of respondents was limited who are appropriate and who have the expertise in the area being studied the technique that was used in this research was Cluster sampling. Representativeness is most important criteria in selecting sampling in this study. Probability sampling representativeness is high and in cluster sampling the subjects are selected in groups or clusters. Sampling helps to determine the corresponding value of the population and plays a vital role in research.

3.8 Data Collection Instrument

A questionnaire designed to contain eight sections. The first section shall aim to collect the background information of the respondents, e.g. their age, gender, position, education, work experience and professional background. The second section shall include the respondents' general opinion on project risk management. The third section shall include an investigation on risk planning and how this task has been managed. The fourth section of the questionnaire explores a system which were used by the organization to identify risk. The fifth section of the questionnaire address the risk analysis approach applied by the organization. The sixth section explores the approach or risk response applied on the project. The seventh section explore the way risk monitoring and control had been addressed. The eight section of the questioner evaluate the organizational culture of a project in relation to risk management.

3.9 Ethical Issues

The study was conducted by adhering to the research ethics. To assure the ethics of the study, the purpose of the study was clearly provided to the respondents and the response has been used only for the purpose of the study without making any adjustment. The responses was also be kept confidential.

3.10 Pilot Testing

The instruments were initially submitted to small scale of respondent to check its effectiveness and efficiency in terms of the required information. It serves as mini versions of a full-scale study (also called 'feasibility' studies), as well as the specific pre-testing of a particular research instrument (Fellows & Liu, 2008). This also gives the researcher and indication of whether the instrument is measuring the right concept, hence its validity and reliability.

Validity refers to how accurately a method measures what it is intended to measure. The reliability of a research instrument is the extent to which the instrument yields the same results on repeated measurements. The tendency toward consistency found in repeated measurements is referred to as reliability (Carmines & Zeller, 1979). The researcher used the retest method to determine the reliability of the instruments by giving the same test to the same people. This was achieved by asking the same question in a slightly different way at a later time or in a different part of the questionnaire. The reliability of the instrument was estimated by examining the consistency of the results between the two measurements. The questionnaires reliability was checked by the Cronbach's-Alpha test coefficient

using excel software and the gained result was 0.835. If Cronbach's-Alpha is >= 0.7, then it is safe. Therefore, based on the test, the results for the items are reliable and acceptable.

Table 3. 1: Reliability and Validity

Reliability Statistics		
	Cronbach's Alpha	No of Items
Socio-demographic Characteristics	0.81	5
Importance Given to Risk Management by the Project	0.78	5
Risk planning in Bole Arabsa project	0.88	7
Risk identification in Bole Arabsa project	0.87	3
Risk analysis in Bole Arabsa project	0.85	4
Risk response or mitigation in Bole Arabsa project	0.86	18
Risk Monitor and Control in Bole Arabsa Project	0.84	4
Organizational Risk Management Culture in Bole Arabsa Project	0.79	3
Weighted average	0.835	49

Source: Own Survey, 2021

3.11 Method of Data analysis

The data gathered from questionnaire was summarized and analyzed by using descriptive statistics like frequency, percentage, mean and standard deviation. Then the results were presented using tables for more clarification and Quantitative statistical analysis for questionnaire was done by using Excel. The data gained from document review was analyzed contextually as per the research basic questions.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS and INTERPRETATION

4.1 Introduction

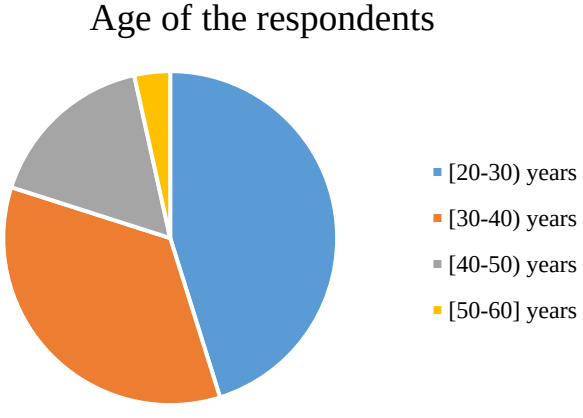
This chapter aims to show the presentation, analysis and interpretation of the data which was collected from respondents. To analyze the collected data in line with the overall objective of the research, statistical procedures were carried out using Excel 2013 software. To determine the actual practice of project risk management at Addis Ababa City Saving Houses Development Enterprise, the researcher has collected the data through questionnaire.

As a means to collect the primary data the researcher used questioners. The primary data that was collected through questionnaire consisted of 49 close ended items which was distributed to 259 individuals who are part of the project team and different individuals who are participating in the projects from project manager to sub contractures gather responses. The response rate among the sample size of 259 were completed and the researcher were able to collect all the questionnaire duly. Here below the data that was collected with its analysis and interpretation is presented.

4.2 General information of respondents

On the general questions about age, gender, highest level of education, total years of work experience & work experience on the project are presented below.

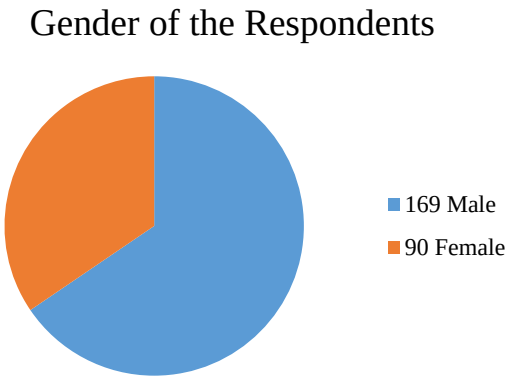
As indicated in figure 4.1, among 259 respondents, majority 45.17% (117) age were between 20-30 years; followed by 34.75% (90) age were between 30-40 and while only 3.47% (1) of the respondent was 50-60 years range. For the purpose of the analysis response of the respondent age were grouped into four categories.



Source: Own Survey, 2021

Figure 4. 1: Age of respondent

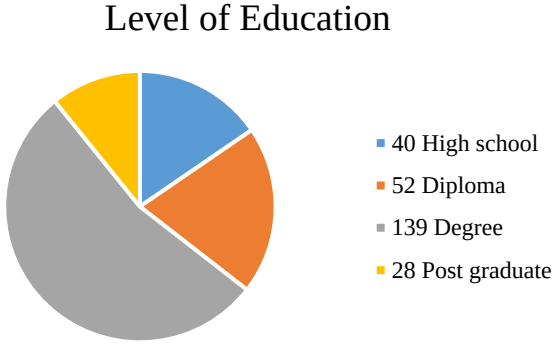
As indicated in figure 4.2, among 259 respondents, 65.25% (169) were male whereas 34.36% (90) were female.



Source: Own Survey, 2021

Figure 4. 2: Gender of the Respondents

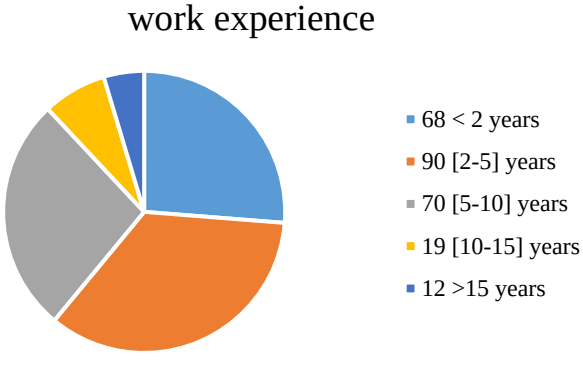
Figure 4.3 presents respondents level of education, 53.67% (139) were those with degree, 20.07 %(52) with diploma, 15.44% (40) with high school certificate and 10.81% (28) were those of who held post graduate degree.



Source: Own Survey, 2021

Figure 4. 3: Highest level of education achieved

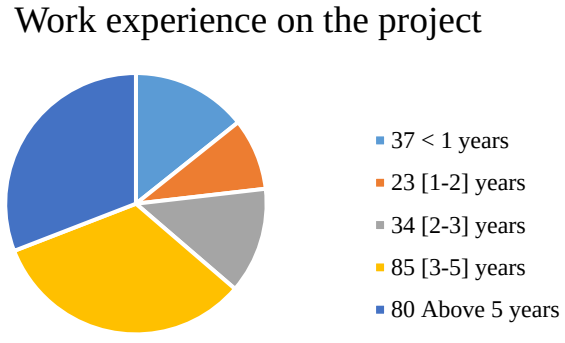
As illustrated on figure 4.4, among 259 respondents, 34.75% (90) of respondents were in there 2 to 5 years of experience; 27.03% (70) of respondents were in 5 to 10 years of experience; 26.25% (68) of respondents were less than 2 years of experience and those who were above 15 years of experience possessed the least; which is 4.63% (12). For the purpose of the analysis response of the respondent work experience were grouped into five categories.



Source: Own Survey, 2021

Figure 4. 4: Total years of work experience acquired

Regarding the project related work of experience, among 259 respondents, 32.82% (85) of respondents were in 3 to 5 years of experience on the project; the number of respondents who were above 5 years of experience possessed 30.88% (80); 14.29% (37) of respondents were acquired less than 1 year of experience; 13.13% (34) of the respondent were in 2 to 3 year of experience and 8.88% (23) of the respondent were 1 to 2 years of experience on the project. For the purpose of the analysis response of the respondent work experience were grouped into five categories.



Source: Own Survey, 2021

Figure 4. 5: Work experience on the project

Based on the data presented above the researcher uncover that about 80% of the respondent were under 40 years this implies that most of the population participating in the project were at the age of productivity. In addition to this the project involves both genders. As ceric, 2003 states the total population were productive the person uses his or her personal experience to handle the specific event or occurrence. The response of respondents agreed to the above presented statement. More than 50% of the respondent acquired degree and minimum of one year experience in a project based works. This directly related to the performance of the project.

4.3 Practices of Risk

4.3.1 Importance Given to Risk Management by the Project

Table 4. 1: Response on General project risk management

There is a policy or guideline that recommends how to manage unexpected uncertainties.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	35	13.52	13.52
	Disagree	79	30.5	30.5
	Neutral	76	29.34	29.34
	Agree	61	23.55	23.55
	Strongly Agree	8	3.08	3.08
	Total	259	100	100
	Mean: 2.722008			
	Standard Deviation: 2.411363			
The project has a defined or standard risk management process.				

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	31	11.97	11.97
	Disagree	79	30.5	30.5
	Neutral	62	23.94	23.94
	Agree	76	29.34	29.34
	Strongly Agree	11	4.25	4.25
	Total	259	100	100
	Mean: 2.833977			
	Standard Deviation: 2.533178			
Responsible person or department is assigned to handle risk when it occurs.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	36	13.9	13.9
	Disagree	85	32.82	32.82
	Neutral	51	19.69	19.69
	Agree	69	26.64	26.64
	Strongly Agree	18	6.94	6.94
	Total	259	100	100
	Mean: 2.633205			
	Standard Deviation: 2.367737			
Risk management is treated as a continuous process in the project.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	36	13.9	13.9
	Disagree	85	32.82	32.82
	Neutral	51	19.69	19.69
	Agree	69	26.64	26.64
	Strongly Agree	18	6.94	6.94
	Total	259	100	100
	Mean: 2.799228			
	Standard Deviation: 2.534701			

Source: Own Survey, 2021

According table 4.1, 3.08% (8) and 23.55% (61) of respondents strongly agree and agreed respectively on the existence of a policy or guideline; on the other hand 30.5% (79) of respondents disagree on the point of the policy or guideline availability & 13.52% (35) of respondents strongly disagree on the availability of the policy. The remaining 29.34% (76) of respondents were neutral.

In relation to establishing a defined or standard risk management process with in the projects, 4.25% (11) and 29.34% (76) of respondents strongly agree and agreed respectively on the existence of a policy

or guideline; on the other hand 30.5% (79) of respondents disagree on the point of the policy or guideline availability & 11.97% (31) of respondents strongly disagree on the availability of the policy. The remaining 23.94% (62) of respondents were neutral.

As illustrated in table 4.1, 1.93% (5) of respondents strongly agreed; again 30.12% (78) of respondents agree on the existence of responsible person or department who handle risk; on contrary 17.76% (46) and 35.14% (91) of respondents strongly disagree and agree respectively and the reaming 15.06% (39) of respondents were neutral.

As presented on the table 4.1 above, 13.9% (36) and 32.82% (85) of respondents strongly disagree and disagree respectively with treatment of risk management as a continuous process; while 6.94% (18) and 26.64% (69) of respondents strongly agree and disagree respectively with treatment other than the two stands about 19.69% (51) of respondents were neutral.

Based on the above result the researcher came to understand the majority of the respondents believed that there was no policy or guideline that proposes how to handle unexpected uncertainties in the time of occurrence. Hamburger (1990) and Murray, et al (1983) have discussed the use of project reserves and contingency amounts as risk management strategies in construction projects. Projects require to have contingency plan to overcome occurrence of uncertainty. According to PMI (2013), Risk Management process include Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses and Monitor & Control Risks even though it incorporates different plans Bole Arabsa housing project luck provision of basic polices and guidelines that recommend management of risk. In addition to this organization require to have standardized risk management process to manage risk management process within the projects. In general the project did not have a well-organized risk response strategy.

The outputs of Plan Risk Responses are Project management plan updates and Project documents updates (Project Management Institute, 2013). Treatment of risk management was not a continuous process in the project and there was no responsible person or department who handle risk. In order to provide Time dependent or on time solution for occurrence of risk it's required to prepare updated risk response plan. However the project was taking reactive measures to manage the risks.

Table 4. 2: Response regarding who handles uncertainties within the project

Uncertainties that occur within the project are mostly handled by: The Project Manager				
		Frequency	Percent	Valid Percent
Valid	Yes	92	35.52	35.52
	No	167	64.48	64.48
	Total	259	100	100
	Mean: 1.644788			
	Standard Deviation: 0.46			

Uncertainties that occur within the project are mostly handled by: The Consultant				
		Frequency	Percent	Valid Percent
Valid	Yes	78	30.12	30.12
	No	181	69.88	69.88
	Total	259	100	100
	Mean: 1.301158			
	Standard Deviation: 0.29			
Uncertainties that occur within the project are mostly handled by: The Client				
		Frequency	Percent	Valid Percent
Valid	Yes	54	20.85	20.85
	No	205	79.15	79.15
	Total	259	100	100
	Mean: 1.208494			
	Standard Deviation: 0.21			
Uncertainties that occur within the project are mostly handled by: A Specialized Risk Management in the Project				
		Frequency	Percent	Valid Percent
Valid	Yes	13	5.02	5.02
	No	246	94.98	94.98
	Total	259	100	100
	Mean: 1.94			
	Standard Deviation: 0.1			
Uncertainties that occur within the project are mostly handled by: All teams participating in the Project				
		Frequency	Percent	Valid Percent
Valid	Yes	103	39.77	39.77
	No	156	60.23	60.23
	Total	259	100	100
	Mean: 1.4			
	Standard Deviation: 0.496			

Source: Own Survey, 2021

As discussed in table 4.2, uncertainties that occur within the project, 35.52% (92) of respondents said it was handled by the project managers; 30.12% (78) of respondents said it was handled by the consultants; 20.85% (54) of respondents said it was handled by the client; 5.02% (13) of respondent said it was handled by a specialized risk management, 39.77% (103) of respondents said it was handled by all teams participating in the project. Though, the figure shows some level of responsibility its clear

to understand there was no designated responsible body to handle occurrence of uncertainty with in the project.

In risk response or handling the role of stakeholders are important in addition to this the role of project manager in a project is crucial in recognizing, understanding and finding the right path to uncover the risk. Risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives (PMI, 2008; ICE, 2005). Though occurrence of the risk in the project handled by all team members. In general the performance or reputations of the organization in relation to managing occurrence of risk and uncertainties were poor.

4.3.2 Risk planning in Bole Arabsa project

Table 4. 3: Risk planning related Response

There is systematic approach or careful planning done to perform risk management in the project.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	47	18.15	18.15
	Disagree	85	32.82	32.82
	Neutral	51	19.69	19.69
	Agree	69	26.64	26.64
	Strongly Agree	7	2.70	2.70
	Total	259	100	100
	Mean: 2.629344			
	Standard Deviation: 2.361205			
Relevant stakeholders are involved in the planning and performing of managing risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	47	18.15	18.15
	Disagree	64	24.71	24.71
	Neutral	7	2.70	2.70
	Agree	107	41.31	41.31
	Strongly Agree	34	13.13	13.13
	Total	259	100	100
	Mean: 3.065637			
	Standard Deviation: 2.870432			
An expert judgment or meetings are considered while planning for risks that might occur in the project.				

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	47	18.15	18.15
	Disagree	65	25.09	25.09
	Neutral	70	27.02	27.02
	Agree	69	26.64	26.64
	Strongly Agree	8	3.09	3.09
	Total	259	100	100
	Mean: 2.714286			
	Standard Deviation: 2.436847			

Risk management is treated as a continuous process in the project.

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	24	9.27	9.27
	Disagree	73	28.18	28.18
	Neutral	65	25.09	25.09
	Agree	84	32.43	32.43
	Strongly Agree	13	5.02	5.02
	Total	259	100	100
	Mean: 2.957529			
	Standard Deviation: 2.639176			

Environmental factors are included as an input to plan for uncertainties.

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	48	18.54	18.54
	Disagree	44	16.98	16.98
	Neutral	65	25.09	25.09
	Agree	89	34.36	34.36
	Strongly Agree	13	5.02	5.02
	Total	259	100	100
	Mean: 2.903475			
	Standard Deviation: 2.640639			

Team members within the project receive training or have enough knowledge about how to handle uncertainties.

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	55	21.23	21.23
	Disagree	52	20.08	20.08
	Neutral	70	27.02	27.02
	Agree	51	19.69	19.69
	Strongly Agree	31	11.96	11.96
	Total	259	99.98	99.98

	Mean: 2.810811			
	Standard Deviation: 2.603828			
Risk management plan is incorporated with the project plan.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	55	21.23	21.23
	Disagree	31	11.96	11.96
	Neutral	77	29.76	29.76
	Agree	57	22.00	22.00
	Strongly Agree	39	15.05	15.05
	Total	259	100	100
	Mean: 2.976834			
	Standard Deviation: 2.770501			

Source: Own Survey, 2021

As presented in table 4.3, 18.15% (47) & 32.82% (85) of respondents strongly disagree and disagree respectively on the existence of careful planning for the risk management in the project; while 26.64% (69) and 2.7% (7) of respondents shared their views by agreeing to the statement of a careful planning. The remaining 19.69% (51) of respondents were neutral.

In regarding to stakeholders are involvement As presented on the table 4.3 above, 18.15% (47) & 24.71% (64) of respondents strongly disagree and disagree respectively to the existence of stakeholder involvement in the planning of risk management; 41.31% (107) & 13.13% (34) of respondents agree and strongly disagree respectively in stakeholder's involvement in the planning and performing of managing risk. But 2.70% (7) of respondent were neutral.

As illustrated in table 4.3, 18.15% (47) & 25.09% (65) of respondents strongly disagree and disagree respectively on the consideration of expert judgment or meetings while planning of risks; while 26.64% (69) and 3.09% (8) of respondents agree that expert judgment or meetings were considered while planning for risks. On the other hand 27.02% (70) of respondents were neutral.

From the table 4.3, 9.27% (24) & 28.18% (73) of respondents strongly disagree and disagree respectively that risk management was treated as a continuous process; while 32.43% (84) & 5.02% (13) of respondents agree and strongly agree that risk management was treated as a continuous process. The remaining 25.09% (65) of respondents were neutral.

As discussed in table 4.3, 18.54% (48) strongly disagree and 16.98% (44) disagree with the inclusion of environmental factors as an input to plan for uncertainties; while 34.36% (89) & 5.02% (13) of respondents were agree and strongly agree respectively with the inclusion environmental factors as an input to plan for uncertainties and the reaming 25.09% (65) of the respondents were neutral.

As table 4.3 shows skill and knowledge upgrading, 21.23% (55) & 20.08% (52) of respondents strongly disagree and disagree respectively about the existence of training for team members that help them

handle uncertainties; however 19.69% (51) & 11.96% (31) respondents agree and strongly agree respectively with availability of training. On the other hand 27.02% (70) of respondents were neither agreed nor disagreed to the availability of training.

As presented in table 4.3, from a total of 259 respondents 21.23% (55) are strongly disagree, 11.96% (31) disagree, 29.76% (77) were neutral, 22% (57) agree and finally the reaming 15.05% (39) strongly agreed to the practice of risk management plan incorporation with the project plan. The researcher identifies that the project incorporate its risk management plan within the project plan.

Planning positively contribute for the success of risk management in a project. However researcher came to understand that the majority of the respondents believed that there were no systematic approach or a careful planning done to perform risk management in the project. In relation to stakeholder involvement; relevant stakeholders were involved in the planning and performing of managing risk in the project. Risk management plan and risk register are inputs to prepare risk responses plan. The tools and techniques for Plan Risk Responses are Strategies for negative risks or threats, Strategies for positive risks or opportunities, Contingent response strategies & Expert judgment. Expert Consultation or expert judgment narrow down the gap and provide relevant constructive criticism. Even if expert judgment contribute to strengthen the risk management plan, the project management team did not consider expert consultation while preparing risk management plan for the project.

Based on the above result the mean value of risk management treated as a continuous process and consideration of Environmental factors are presented respectively 2.95 and 2.90 is greater than neutral stand (2.5) for risk planning. This implies both continuous process risk management and environmental factors are was properly considered in the project. The project give proper attention to the environmental factors by considering the environmental aspect in the process of planning for uncertainty. On the other hand the project lack provision of training. Training and skill development programs improve the performance of team members in the project.

4.3.3 Risk identification in Bole Arabsa project

Table 4. 4: Response to Team Members Role in Risk Identification

All team members within the project play a role in identifying risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	55	21.23	21.23
	Disagree	50	19.3	19.3
	Neutral	69	26.63	26.63
	Agree	77	29.76	29.76
	Strongly Agree	8	3.08	3.08
	Total	259	100	100
	Mean: 2.741313			
	Standard Deviation: 2.483925			

Source: Own Survey, 2021

As table 4.4 illustrated, 21.23% (55) & 19.3% (50) of respondents strongly disagree and disagree respectively the existence of role played by team members in identifying risk; 29.76% (77) & 3.08% (8) of respondents agree and strongly agree respectively with role played by team members in identifying risks. However, 26.63 % (69) respondents were neutral.

According to PMI (2013) risks identification is the process of determining which risks may affect the project and documenting their characteristics. Any source of information that allows recognition of a potential problem can be used for risk identification. Stakeholders are primary source of information for any projects. Their intensive involvement in the project make them reliable and effective means of information for the project to conduct risk identification process. According to PM 2013 stakeholders considered as input for risk identification. The word stakeholder stands for all interested parties in the project and this includes staff directly participating in the project. How Ever team members or project team shows low or poor performance in relation to risk identification in the project.

Table 4. 5: Response to method used in identifying risk

SN	Method Used	Response	Frequency	Percent	Valid Percent
1	Expert Judgment	Yes	72	27.79	27.79
		No	187	72.21	72.21
		Total	259	100	100
		Mean: 1.77			
		Standard deviation: 0.422			
2	Checklist	Yes	95	36.67	36.67
		No	164	63.33	63.33
		Total	259	100	100
		Mean: 1.65			
		Standard deviation: 0.431			
3	Document Review	Yes	81	31.28	31.28
		No	178	68.72	68.72
		Total	259	100	100
		Mean: 1.7			
		Standard deviation: 0.484			
4	Information Gathering	Yes	120	46.33	46.33
		No	139	53.67	53.67
		Total	259	100	100
		Mean: 1.52			
		Standard deviation: 0.504			
5	Assumption Analysis	Yes	96	37.06	37.06
		No	163	62.94	62.94
		Total	259	100	100
		Mean: 1.64			

		Standard deviation: 0.482			
SN	**Source of risk**	**Response**	**Frequency**	**Percent**	**Valid Percent**
1	Technical	Yes	163	62.94	62.94
		No	96	37.06	37.06
		Total	259	100	100
		Mean: 1.39			
		Standard deviation: 0.493			
2	financial	Yes	91	35.14	35.14
		No	168	64.86	64.86
		Total	259	100	100
		Mean: 1.65			
		Standard deviation: 0.483			
3	Human	Yes	178	68.72	68.72
		No	81	31.28	31.28
		Total	259	100	100
		Mean: 1.34			
		Standard deviation: 0.474			

Source: Own Survey, 2021

As table 4.5 illustrated, among the method used to identify risks, 27.79 % (72) respondents believed there was an expert judgment; while 72.21% (187) of respondents said 'No'; 36.67 % (95) of respondents believed there was a checklist that used to identify the risk in the project; while majority 63.33% (164) of respondents said 'No' in the usage of checklist as a method in identifying risks.

Response method to identify risk in the project used were document review, information gathering and assumption analysis; according to the prior order 31.28 % (81), 46.33 % (120) and 37.06% (96) were a positive or yes response from respondents however the reaming 68.72 % (178), 53.67% (139) and 62.94 % (163) oppose the previous response of the respondent.

As presented in table 4.5, the majority of risk associated with human 68.72 % (178) then 62.94 % (163) by technical incapability and the least reason for risk in the project were finance 35.14 % (91).

According to PMI (2013) the input for risk identification are Risk management plan, Cost management plan, Schedule management Plan, Quality management plan, Human resource management plan, Scope baseline, Activity cost estimates, Activity duration Estimates, Stakeholder register, Project documents, Procurement documents, Enterprise environmental Factors, Organizational process assets. The tools and techniques are Documentation reviews, Information gathering Techniques, Checklist analysis, Assumptions analysis, Diagramming techniques, SWOT analysis & Expert judgment. The output is a risk register. This project require to conduct risk identification using the prior listed tools and techniques. However the project don't conduct risk identification using methods listed above. Relatively the project use information gathering techniques as a tool to collect relevant data from the project.

The risk identification process normally considers the product description, scope, WBS, planning documents, historical information, and industry information to determine sources of risk, potential risk events, and risk symptoms (Brandon, 2006). This project exposed to all the three risks and based on the intensity or level of exposure human and technical took the first and second position. The most susceptible side or the weak point of the project is human.

4.3.4 Risk analysis in Bole Arabsa project

Table 4. 6: Risk Analysis related responses

Characteristics of the risk are considered before analyzing the identified risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	39	15.05	15.05
	Disagree	75	28.95	28.95
	Neutral	61	23.54	23.54
	Agree	77	29.76	29.76
	Strongly Agree	7	2.7	2.7
	Total	259	100	100
	Mean: 2.621622			
	Standard Deviation: 2.454214			
There is a measurement system to analyze the risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	50	19.3	19.3
	Disagree	39	15.05	15.05
	Neutral	68	26.25	26.25
	Agree	89	34.36	34.36
	Strongly Agree	13	5.02	5.02
	Total	259	100	100
	Mean: 3.092664			
	Standard Deviation: 2.816115			
Project documents are updated after assessment of the risk that might occur.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	50	19.3	19.3
	Disagree	68	26.25	26.25
	Neutral	56	21.62	21.62
	Agree	77	29.76	29.76
	Strongly Agree	8	3.08	3.08
	Total	259	100	100

	Mean: 2.710425
	Standard Deviation: 2.451065

Source: Own Survey, 2021

As labeled in table 4.6, 15.05% (39) of the respondent strongly disagree, 28.95% (75) of respondents also disagree in the existence of consideration of risk characteristics before analyzing the identified risk; on the other hand 29.76% (77) & 2.7% (7) of respondents agree and strongly agree respectively believed characteristics of the risk were considered before analyzing the identified risk. However about 23.54 % (61) were neutral.

As illustrated in table 4.6, 19.3% (50) and 15.05% (39) of respondents strongly disagreed and disagreed respectively that there was no measurement system to analyze the risk; whereas 34.36 % (89) and 5.02% (13) of respondents agreed and strongly agreed respectively that there was a measurement system to analyze the risk. Though about 26.25% (68) of respondent were neural.

As presented in the table 4.6 above, majority 45.55% (118) of respondents believed project documents were not updated after the assessment of risks; but on the other side about 32.84% (85) of respondents believed there was an update in the project after the assessment of risks. However; about 21.62 % (56) of the population neither agreed nor disagreed on the update which is done after the assessment.

Projects use qualitative and quantitative risk analysis to determine the level of threat a project faces. The tools and techniques for perform qualitative risk analysis are Risk probability and impact assessment, Probability and impact matrix, Risk data quality assessment, Risk categorization, Risk urgency assessment & Expert judgment. Use of Risk categorization as a tool to analyze uncertainty or risk in a project minimize extra time and make the task easier. Even if the grouping or categorization plays significant role the project did not consider the Characteristics of the risk before analyzing the identified risk.

Perform Quantitative Risk Analysis is the process of numerically analyzing the effect of identified risks on overall project objectives. The key benefit of this process is that it produces quantitative risk information to support decision making in order to reduce project uncertainty. The nature of quantitative risk analysis require specific measurement. The project uses Measurement system to determine risk level. The project analyze occurrence of risks using this method and Support an argument based on quantified measurement.

Projects are unique. The primary factor that make a project unique is its Context. Risk assessment describe the overall process or method and its identification of hazards and risk factors that have the potential to cause harm (hazard identification). In order to conduct risk assessment the project require to have context. Context can be understood different ways one the location where the project executed and the second can be seen from time perspective. Projects require to acquire update in a consistent manner. On the contrary the project don’t perform update once assessment of risk is done.

Table 4. 7: Response to the techniques used to assess the probability of risk occurrence in the project

SN	Technique Used	Response	Frequency	Percent	Valid Percent
1	Quantitative assessment/Numerical analysis	Yes	54	20.85	20.85
		No	205	79.15	79.15
		Total	259	100	100
		Mean: 1.8			
		Standard deviation: 0.38			
2	Subjective probability assessments based on the expert judgment	Yes	149	57.52	57.52
		No	110	42.48	42.48
		Total	259	100	100
		Mean:1.43			
		Standard deviation: 0.501			
3	Ranking the importance of risks based on past experience	Yes	81	31.28	31.28
		No	178	68.72	68.72
		Total	259	100	100
		Mean: 1.68			
		Standard deviation: 0.463			
4	Qualitative assessment based on historical data	Yes	39	15.06	15.06
		No	220	84.94	84.94
		Total	259	100	100
		Mean: 1.85			
		Standard deviation: 0.362			

Source: Own Survey, 2021

As presented in table 4.7, Quantitative assessment, Subjective probability assessment, Ranking the importance of risks based on the past experience & Qualitative assessment were the technique used to assess the probability of risk occurrence in the project having the value of 57.5% (23), 30.0% (12), 17.5% (7) & 15.0% (6) respectively based on the view of the respondents.

Techniques used to assess probity of risk occurrence are Quantitative assessment/Numerical analysis, Subjective probability assessments based on the expert judgment, ranking the importance of risks based on past experience and qualitative assessment based on historical data. From the provided alternatives the researcher comprehend that as a technique used in assessing the probability of risks, the project used only a subjective probability assessment based on expert judgment the reaming three methods were not applied in the project.

4.3.5 Risk response or mitigation in Bole Arabsa project

Table 4. 8: Response to the strategy to respond to risks

There is a well-developed strategy within the project to respond to risks.

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	50	19.3	19.3
	Disagree	68	26.25	26.25
	Neutral	46	17.76	17.76
	Agree	56	21.62	21.62
	Strongly Agree	39	15.05	15.05
	Total	259	100	100
	Mean: 2.868726			
	Standard Deviation: 2.682706			
Factors such as budget, schedule and resources are considered while responding to risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	15	5.79	5.79
	Disagree	54	20.84	20.84
	Neutral	62	23.93	23.93
	Agree	103	39.7	39.7
	Strongly Agree	25	9.65	9.65
	Total	259	100	100
	Mean: 3.266409			
	Standard Deviation: 2.925061			

Source: Own Survey, 2021

As presented in table 4.8, about 45.55 % (118) of the respondent respond negatively to the existence of the well-developed strategy within the project to respond to risks but on the other hand 36.67% (95) of the respondent shows positive response to the existence of strategy in the project. Even if both side of the raised their points there are 17.76 % (46) respondent who were neutral to the point.

As illustrated in table 4.8, according the view of the respondents 32.42 % (69) were oppose or stand negatively to the consideration of budget, schedule and resources but on the other side 49.35 % (128) respondents accept the application of respondents believe factors such as budget, schedule & resources in the project. The remaining 23.93 % (62) were not aware of the information or neutral.

Risk mitigation or response refers to the process of planning and developing methods and options to reduce threats or risks to project objectives. Risk mitigation strategies are designed to eliminate, reduce or control the impact of known risks intrinsic with a specified undertaking, prior to any injury or fiasco. Though the project do not establishes strategy within the project to respond to risk.

The project team mitigates risks in various ways; risk avoidance, risk sharing, risk reduction and risk transfer. Selecting of the right alternative or option that enables proper response to the scenario comes with a cost. Organizations should consider Factors such as budget, schedule and resources while

choosing mitigation strategy. The project takes in to consideration different factors such as budget, schedule & resources while responding to risk.

Table 4. 9: Response to risk response strategies

SN	Risk Response Strategy	Response	Frequency	Percent	Valid Percent
1	Reduction	Yes	168	64.86	64.86
		No	91	35.14	35.14
		Total	259	100	100
		Mean: 1.35			
		Standard deviation: 0.483			
2	Avoidance	Yes	91	35.14	35.14
		No	168	64.86	64.86
		Total	259	100	100
		Mean: 1.65			
		Standard deviation: 0.483			
3	Transfer	Yes	31	11.97	11.97
		No	228	88.03	88.03
		Total	259	100	100
		Mean: 1.89			
		Standard deviation: 0.302			
4	Acceptance	Yes	45	17.38	17.38
		No	214	82.62	82.62
		Total	259	100	100
		Mean: 1.845			
		Standard deviation: 0.36			

Source: Own Survey, 2021

As demonstrated in table 4.9 above, based on the respondent response from the above listed strategies; reduction strategy 64.86 % (168) then followed by 35.14 % (91) avoidance then acceptance 17.38 % (45) in third place; last chose transfer strategy 11.97 % (31).

Risk reduction is a risk management technique that involves reducing the financial loss. This encompasses a whole range of things including reducing the severity of a loss, reducing its frequency, or making it less likely to occur overall. Assigning highly skilled project personnel to manage the high-risk activities is another risk reduction method. The project execute only risk reduction strategy to reduce impact of risk. It has a Proactive nature. Taking of measurement before the occurrence of the condition.

4.3.5.1 Risk avoidance in Bole Arabsa project

Table 4. 10: Risk avoidance related responses

The organization encourages use of contingency plans or in order to avoid any situation that may cause delays in project implementation.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	10	3.86	3.86
	Disagree	62	23.93	23.93
	Neutral	41	15.83	15.83
	Agree	121	46.71	46.71
	Strongly Agree	25	9.65	9.65
	Total	259	100	100
	Mean: 3.343629			
	Standard Deviation: 2.994203			

The organization encourages use of detailed work plans so as to limit occurrence of anything that may delay the implementation of the project.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	36	13.89	13.89
	Disagree	31	11.96	11.96
	Neutral	58	22.39	22.39
	Agree	121	46.71	46.71
	Strongly Agree	13	5.02	5.02
	Total	259	100	100
	Mean: 3.169884			
	Standard Deviation: 2.86235			

The organization has put in place protection and safety systems against any event that may delay the project implementation				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	23	8.88	8.88
	Disagree	96	37.06	37.06
	Neutral	77	29.72	29.72
	Agree	60	23.16	23.16
	Strongly Agree	3	1.15	1.15
	Total	259	100	100
	Mean: 2.984556			
	Standard Deviation: 2.631851			

The organization uses regular inspections to ensure no issue arises that may delay project implementation				
		Frequency	Percent	Valid Percent
	Strongly Disagree	10	3.86	3.86
	Disagree	48	18.53	18.53

Valid	Neutral	77	29.72	29.72
	Agree	121	46.71	46.71
	Strongly Agree	3	1.15	1.15
	Total	259	100	100
	Mean: 3.227799			
	Standard Deviation: 2.827062			
The organization has a program on training of employees on how to ensure that projects run on schedule				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	29	11.19	11.19
	Disagree	77	29.72	29.72
	Neutral	82	31.66	31.66
	Agree	48	18.53	18.53
	Strongly Agree	23	8.88	8.88
	Total	259	100	100
	Mean: 2.841699			
	Standard Deviation: 2.548374			

Source: Own Survey, 2021

As illustrated in table 4.10, 3.86% (10) & 23.93% (62) of respondents strongly disagree and disagree respectively that the organization did encourage the use of contingency, on the other hand 46.71 % (121) and 9.65 % (25) of the respondent agree and strongly agree that the organization encouraged use of contingency plans which helps in overcoming the delays of project implementation. About 15.83% (41) of the respondent did not claim any of the side.

As presented in table 4.10, 13.89 % (36) & 11.96 % (31) of respondents strongly disagree and disagree respectively that the organization did encourage the use of detailed work plans; whereas 46.71 % (121) and 5.02 % (13) of the respondent agree and strongly agree that the organization encouraged the use of detailed work plan so as to limit occurrence of anything that may delay the implementation of the project. The remaining 27.5% (11) of respondents were not sure whether the organization used detailed work plan or not.

As discussed in table 4.10, 45.94% (119) of respondents believed the organization didn't place protection and safety system; whereas 24.31% (63) respondents believed the organization placed protection and safety systems against any event that may delay the project implementation. The remaining 29.72% (77) of respondents were not sure on the availability of protection and safety systems.

As illustrated in table 4.10, 3.86 % (10) & 18.53 % (48) of respondents strongly disagree and disagree respectively that the organization did use regular inspection; whereas 46.71 % (121) and 1.15 % (3) of the respondent agree and strongly agree that the organization used regular inspection to ensure no issue arises that may delay project implementation. 29.72 % (77) of respondents were neutral.

As presented in table 4.10, 11.19 % (29) & 29.72 % (77) of respondents strongly disagree and disagree respectively that the organization did have a program for training their employee; whereas 18.53 % (48) and 8.88 % (23) of the respondent agree and strongly agree that the organization has a program on training of employees on how to ensure that projects run on schedule. The remaining 31.66 % (82) of respondents were not sure whether there was training program or not.

The avoidance strategy presents the accepted and assumed risks and consequences of a project and presents opportunities for avoiding those accepted risks. Some methods of implementing the avoidance strategy is to plan for risk and then to take steps to avoid it. This plan contain alternative or contingency plan within it or contingency plans are considered in the planning if the first alternative fails. The project encourages use of contingency or another alternative plans in order to avoid any situation that may cause delays in project implementation. In addition to the planning process conduct in detail in order to avoid unseen events. Risk avoidance is the elimination or avoidance of some risk, or class of risks, by changing the parameters of the project. It seeks to reconfigure the project such that the risk in question disappears or is reduced to an acceptable value. The nature of the solution may be engineering, technical, financial, political, or whatever else addresses the cause of the risk. The project prepare detail plans that shows different alternative solution according to the nature of risk.

Risk avoidance involves developing an alternative strategy that has a higher probability of success but usually at a higher cost associated with accomplishing a project task. Safety and protection systems comes with accost but in order to reach to decision it require to prepare cost benefit analysis. Though introduction of protection and safety feature to the project is much cheap than covering of cost of risk. However the project did not provide protection and safety systems against any event that may delay the project implementation. Based on the above result the investigator came to understand that the project uses regular inspections to ensure no issue arises that may delay project implementation. Provision of consistent self-development program enhance level of performance in an organization. Training is teaching, or developing in oneself or others, any skills and knowledge or fitness that relate to specific useful competencies. Training has specific goals of improving one's capability, capacity, productivity and performance. The project didn’t organize or provide a training program for employees on how to ensure that projects run on schedule.

4.3.5.2 Risk transfer in Bole Arabsa project

Table 4. 11: Risk transfer related responses

The organization usually outsources some functions especially on those that may impact on the duration of the project.				
		Frequency	Percent	Valid Percent
	Strongly Disagree	48	18.53	18.53
	Disagree	58	22.39	22.39

Valid	Neutral	19	7.33	7.33
	Agree	121	46.71	46.71
	Strongly Agree	13	5.02	5.02
	Total	259	100	100
	Mean: 2.972973			
	Standard Deviation: 2.73826			
The organization buys insurance premium on some items so as to ensure no occurrence will cause a delay in project implementation.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	20	7.72	7.72
	Disagree	48	18.53	18.53
	Neutral	121	46.71	46.71
	Agree	54	20.84	20.84
	Strongly Agree	16	6.17	6.17
	Total	259	100	100
	Mean: 2.992278			
	Standard Deviation: 2.628916			
The organization enters into legal agreements especially regarding any event that may cause the project implementation to delay.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	11	4.24	4.24
	Disagree	62	23.93	23.93
	Neutral	56	21.62	21.62
	Agree	82	31.66	31.66
	Strongly Agree	48	18.53	18.53
	Total	259	100	100
	Mean: 3.362934			
	Standard Deviation: 3.046613			

Source: Own Survey, 2021

As illustrated in table 4.11, 40.92% (106) of respondents believed that the organization didn't outsource certain function for sub contractures; but on the other side about 51.73 % (134) of respondents believed the organization usually outsources some functions especially on those that may impact on the duration of the project. However there were about 7.33% (19) of respondents neither agreed nor disagreed in the outsourcing of activities.

As discussed in table 4.11, 7.72 % (20) & 18.53 % (48) of respondents strongly disagree and disagree respectively that the organization did buy insurance premium; whereas 20.84 % (54) and 6.17 % (16) of the respondent agree and strongly agree that the organization buys Insurance premium on some items

so as to ensure no occurrence will cause a delay in project implementation. About 46.71% (121) of respondent were remain neutral.

As illustrated in table 4.11, 4.24 % (11) & 23.93 % (62) of respondents strongly disagree and disagree respectively that the organization did enters in to legal agreements; whereas 31.66 % (82) and 18.53 % (48) of the respondent agree and strongly agree that the organization enters into legal agreements especially regarding any event that may cause the project implementation to delay. The remaining 21.62 % (56) of respondents were not sure whether the organization enters in to legal agreement or not.

Risk Transfer is a risk reduction method that shifts the risk from the project to another party. Based on the above result the investigator came to understand that the organization outsources some functions especially on those that may impact on the duration of the project. For instance production of prefabricated modules like HCB, agro stone and other construction inputs were supplied by third party. In addition to this tasks even provide to small and medium enterprise. The purchase of insurance on certain items is a risk-transfer method. The risk is transferred from the project to the insurance company. However the organization/ project culture in buying insurance premium that may prevent the delay in project implementation was low. In other word the project did not apply or use risk transfer in terms of insurance coverage. Provision of legally binding agreements are applied in risk transfer. This strategy may be applied to contractors, sureties, or insurance firms. From the above result the investigator identified that the organization / projects enters into legal agreements especially regarding any event that may cause the project implementation to delay.

4.3.5.3 Risk reduction in Bole Arabsa project

Table 4. 12: Risk reduction related responses

The organization conducts periodic meetings with project team to alleviate the possible causes of project delay.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	25	9.65	9.65
	Disagree	41	15.83	15.83
	Neutral	56	21.62	21.62
	Agree	126	48.64	48.64
	Strongly Agree	11	4.24	4.24
	Total	259	100	100
	Mean: 3.220077			
	Standard Deviation: 2.881173			
The organization uses quality assurance technique as a method to ensure that any situation that may cause project delay is eliminated.				
		Frequency	Percent	Valid Percent
	Strongly Disagree	2	0.77	0.77
	Disagree	46	17.76	17.76

Valid	Neutral	62	23.93	23.93
	Agree	131	50.57	50.57
	Strongly Agree	18	6.94	6.94
	Total	259	100	100
	Mean: 3.451737			
	Standard Deviation: 3.04154			
The organization adheres to signed contracts terms and conditions on the issues that may influence the duration of implementation of projects.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	15	5.79	5.79
	Disagree	101	38.99	38.99
	Neutral	69	26.64	26.64
	Agree	56	21.62	21.62
	Strongly Agree	18	6.94	6.94
	Total	259	100	100
	Mean: 2.849421			
	Standard Deviation: 2.522486			
The organization plans for crisis meetings and disaster recovery plans on issues that may affect the duration that the project will take in order to avoid such scenarios.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	21	8.1	8.1
	Disagree	88	33.97	33.97
	Neutral	75	28.95	28.95
	Agree	60	23.16	23.16
	Strongly Agree	15	5.79	5.79
	Total	259	100	100
	Mean: 2.84556			
	Standard Deviation: 2.520955			

Source: Own Survey, 2021

As presented in table 4.12, 9.65 % (25) & 15.83 % (41) of respondents strongly disagree and disagree respectively that the organization did conduct periodic meetings; whereas 48.64 % (126) and 4.24 % (11) of the respondent agree and strongly agree that the organization conducts periodic meetings with project team to alleviate the possible causes of project delay. About 21.62 % (56) of respondents were not aware of whether the organization conducts periodic meetings or not.

As presented in table 4.12, 0.77 % (2) & 17.76 % (46) of respondents strongly disagree and disagree respectively that the organization did use quality assurance technique; whereas 50.57 % (131) and 6.94 % (18) of the respondent agree and strongly agree that the organization uses quality assurance technique

as a method to ensure that any situation that may cause project delay is eliminated. The remaining 23.93% (62) of respondents were not sure whether the organization uses quality assurance technique or not

As presented in table 4.12, 5.79 % (15) & 38.99 % (101) of respondents strongly disagree and disagree respectively that the organization did adheres to signed contracts terms and conditions; whereas 21.62 % (56) and 6.94 % (18) of the respondent agree and strongly agree that the organization adheres to signed contracts terms and conditions on the issues that may influence the duration of implementation of projects. The remaining 26.64 % (69) of respondents were not sure whether the organization adheres to signed contracts terms and conditions or not.

As presented in table 4.12, 8.1 % (21) & 33.97 % (88) of respondents strongly disagree and disagree respectively that the organization did plan for crisis meetings & disaster recovery plan; whereas 23.16 % (60) and 5.79 % (15) of the respondent agree and strongly agree that the organization plans for crisis meetings and disaster recovery plans on issues that may affect the duration that the project will take in order to avoid such scenarios. About 28.95 % (75) of the respondent were neutral.

Risk reduction is a risk management technique that involves reducing the financial consequences of a loss. This encompasses a whole range of things including reducing the severity of a loss, reducing its frequency, or making it less likely to occur overall. The project conducts periodic meetings with project team to alleviate the possible causes of project delay. In this meeting possible cause of risk, alternative solution for the problems raised.

Measures to reduce the frequency or severity of losses, also known as loss control. May include engineering, fire protection, safety inspections, or claims management. Based on the above result the investigator came to understand that the use of quality assurance technique in the project also visible. For instance in terms of technical work the project performance can be considered as good but in relation to claim management in the project performed in a poor way. The project/ organization lack commitment in adhering to signed contract terms and conditions on the issues that may influence the duration of implementation of the project. The main issue that the project face were delay in project implementation. This is one of the iron triangle of the project, time. To show this Addis Ababa housing cooperation plan to complete in 1 and half year for G+4 and 2 years for G+7 buildings. Though the project will take 7 and half year to complete the project. This mean the project schedule variation become 5 and half year for G+7 buildings. On the other hand, for G+4 buildings schedule variation will be 5 years. Based on the above provided information the investigator able to see weak or poor preparedness for planning crisis and disaster recovery plans on issues that may affect the duration of the project.

4.3.5.4 Risk acceptance in Bole Arabsa project

Table 4. 13: Risk acceptance related responses

On some occasions the organization takes no action because it recognizes that though some events may occur and affect duration of the project, it is best not to do anything about them.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	19	7.33	7.33
	Disagree	60	23.16	23.16
	Neutral	75	28.95	28.95
	Agree	103	39.76	39.76
	Strongly Agree	2	0.77	0.77
	Total	259	100	100
	Mean: 3.034749			
	Standard Deviation: 2.669722			

Source: Own Survey, 2021

As presented in table 4.13, 7.33 % (19) & 23.16 % (60) of respondents strongly disagree and disagree respectively that the organization takes no action; whereas 39.76 % (103) and .77 % (2) of the respondent agree and strongly agree that the organization takes no action because it recognizes that though some events may occur and affect duration of the project, it is best not to do anything about them. There were about 28.95% (75) of respondents were not sure whether the organization takes no action or not.

Risk acceptance becomes an option when small and infrequent risks are identified, and since they are not catastrophic or expensive, no efforts are made to manage them. The impacts of such uncertainties are usually deemed as bearable or otherwise too expensive and are, therefore, accepted as part of the system and dealt with as they occur. Some risks may be accepted: in some cases, it is cheaper to leave an asset unprotected due to a specific risk, rather than make the effort (and spend the money) required to protect it. The potential loss from the identified and accepted risk is considered bearable Based on the above provided data the investigator able to understand the requirement of abstinence action. This is because of the complex nature of the work the organization takes no action because it recognizes that though some events may occur and affect duration of the project, it is best not to do anything about them. As a client Addis Ababa housing corporation raise issues related to schedule but terminating agreement with contracture and subcontractors make the project even more susceptible for schedule variation than the previous. It’s acceptable to tolerate some schedule variation.

4.3.6 Risk monitor & control in Bole Arabsa project

Table 4. 14: Risk monitor & control related responses

Based on the current result of the project are risks monitored and controlled well.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	21	8.1	8.1
	Disagree	131	50.57	50.57
	Neutral	62	23.93	23.93
	Agree	30	11.58	11.58
	Strongly Agree	15	5.79	5.79
	Total	259	100	100
	Mean: 2.563707			
	Standard Deviation: 2.235204			
The Project monitor, control and review the process for risk management to ensure that it complies with standards and procedures.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	33	12.74	12.74
	Disagree	110	42.85	42.85
	Neutral	48	18.53	18.53
	Agree	47	18.14	18.14
	Strongly Agree	21	8.10	8.10
	Total	259	100	100
	Mean: 2.664093			
	Standard Deviation: 2.400129			
Information available or the history of the project is used to supplement to control risk.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	45	17.37	17.37
	Disagree	80	30.88	30.88
	Neutral	68	26.25	26.25
	Agree	56	21.62	21.62
	Strongly Agree	10	3.86	3.86
	Total	259	100	100
	Mean: 2.637066			
	Standard Deviation: 2.357932			
Risks that occur within the project are controlled in a way that goes with the goal and objective of the project.				

		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	21	8.10	8.10
	Disagree	80	30.88	30.88
	Neutral	82	31.66	31.66
	Agree	56	21.62	21.62
	Strongly Agree	20	7.72	7.72
	Total	259	100	100
	Mean: 2.899614			
	Standard Deviation: 2.579994			

Source: Own Survey, 2021

As depicted in table 4.14, 8.1 % (21) & 50.57 % (131) of respondents strongly disagree and disagree respectively that the organization did monitor and control well; whereas 11.58 % (30) and 5.79 % (15) of the respondent agree and strongly agree that the organization well monitored and controlled project risks. About 23.93 % (62) remain neutral whether the organization well monitored and controlled project risks or not.

From table 4.42, about 12.74% (33) of respondent were strongly disagreed, 42.85 % (110) of respondent also disagreed to comply with the proper monitor, control and review process; however the remaining respondents about 18.14% (47) and 8.1% (21) agreed and strongly agreed that the project monitor, control and review the process for risk management to ensure that it complies with standards and procedures. Other than both side there were 18.53% (48) neutral respondents.

As illustrated in table 4.14, 17.37 % (45) & 30.88 % (80) of respondents strongly disagree and disagree respectively that the organization did believe in the availability of information/ the project has used history; whereas 21.62 % (56) and 3.86 % (10) of the respondent agree and strongly agree that the organization has used information available or the history of the project is used to supplement to control risk. About 26.25% (68) of the respondent neither agreed nor disagreed on the availability of information.

As presented in table 4.14, about 38.98 % (101) of the respondent strongly disagree and disagree that the organization did control risk in a way that meet the goal; on the other side 29.34 % (76) of the respondent agreed and strongly agreed to the management of risks that occur within the project are controlled in a way that goes with the goal and objective of the project. The remaining 31.66 % (82) of respondents were not sure whether the organization control risk in a way that meet the goal or not.

A standard specifies uniform uses of specific technologies or configurations. Here we are talking about a specific internal standard of an organization. People sometimes talk about employment standards or rules (like rules of conduct or performance). These do fall within this category. A procedure provides detailed mandatory steps (sometimes in the form of a checklist) someone needs to follow to achieve a recurring task or comply with a policy. On the side procedures can include step by step instructions or statements telling you where something needs to go. A procedure informs employees how to carry out

or implement a policy. Based on the information present above the researcher able to uncover the performance of the project / organization towards achieving standard and procedure in relation to monitoring, control, & review didn't fulfil the requirement. The general objective of having standard and procedure was to perform the task or realize the objective of the project. However the researcher able to identify that monitoring and controlling work of the organization was done in a weak manner or the performance was bad. Evaluating criteria for a project are time, quality, scope and cost of the project. This project failed to achieve time (schedule), cost and quality. For example the budget of the project was 6.1 and 7.1-7.6 million birr for G+4 and G+7 respectively. But in the case the budgeted cost varied by 26% resulted from such as inflation in the country economy that leads to rising labor costs, rising costs of raw materials, components and transport costs and because of change in the design of buildings in which the demand of the studio will increase which will not deliberate in the previous design. Cost variation in G+4 and G+7 building is 1,586,000 birr and 1,976,000 birr respectively. From this data the researcher understand that, risks that occur within the project are not controlled in a way that goes with the goal and objective of the project. In addition to this the organization/ project did not use information recorded in the past to take corrective action in relation to risk control.

4.3.7 Organizational risk management culture in Bole Arabsa project

Table 4. 15: Organizational risk management culture related responses

The organization uses a recognized training method to facilitate the improvement of general knowledge on risk management.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	18	6.94	6.94
	Disagree	99	38.22	38.22
	Neutral	60	23.16	23.16
	Agree	64	24.71	24.71
	Strongly Agree	18	6.94	6.94
	Total	259	100	100
	Mean: 2.864865			
	Standard Deviation: 2.551402			
The organization provides funding to facilitate management of risks that may delay projects.				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	18	6.94	6.94
	Disagree	99	38.22	38.22
	Neutral	60	23.16	23.16
	Agree	64	24.71	24.71
	Strongly Agree	18	6.94	6.94
	Total	259	100	100

	Mean: 2.714286			
	Standard Deviation: 2.4777			
The organization effectively communicates the risk to the employees or stakeholders (internal and external).				
		Frequency	Percent	Valid Percent
Valid	Strongly Disagree	27	10.42	10.42
	Disagree	85	32.81	32.81
	Neutral	50	19.30	19.30
	Agree	80	30.88	30.88
	Strongly Agree	17	6.56	6.56
	Total	259	100	100
	Mean: 2.903475			
	Standard Deviation: 2.614188			

Source: Own Survey, 2021

As presented in table 4.15, 45.16 % (117) of respondents didn't agree in the presence of recognized training method; whereas 31.65% (82) of respondents agree on the existence of recognized training method to facilitate the improvement of general knowledge on risk management. Around 23.16 % (60) were neutral on the case or respondents were not aware of the use of recognized training method.

As illustrated on table 4.15, 15.83 % (41) & 38.22 % (99) of respondents strongly disagree and disagree respectively that the organization provision of funding to facilitate management of risk is concerned, whereas 27.41 % (71) and 6.94 % (18) of the respondent agree and strongly agree that the organization provides funding to facilitate management of risks that may delay projects. The remaining 11.58 % (30) of respondents were not sure whether the organization provide funding to facilitate management of risks or not.

As illustrated in table 4.15, 10.42 % (27) & 32.81 % (85) of respondents strongly disagree and disagree respectively that the organization did have effective communication channel; whereas 30.88 % (80) and 6.56 % (17) of the respondent agree and strongly agree that the organization or the project effectively communicates the risk to the employees or stakeholders. About 19.3 % (50) of the respondents were neutral or not sure whether the organization effectively communicate the risk or not.

Organizational culture was significant in defining your company's internal and external identity, in living your company's core values, in transforming your company into a team and in impacting performance and employee wellbeing in a given organization. Organizational culture determine the success or failure of the organization or a project.

In general the risk management culture of this organization was poor and it's a result of having poor organizational culture in striving for success. The project failed to use recognized training method to improve the general knowledge of the employee on risk management and project did not provides funding to facilitate risk management practice. In addition to this the organization or project means of communication to risk management was bad.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this chapter is to summarize the research project. It includes a restatement of the research questions, the research methodology used and a summary of the research project results, conclusions and discussion. The recommendations that might help to improve the Addis Ababa City Saving Houses Development Enterprise in regard to risk management practice and also recommends areas for further research in future studies.

5.2 Summary of the Findings

Based on the analysis done in the above chapters, the researcher reached to the Following findings.

- Based on the response of the respondent regarding to the general question on project risk management practice on the projects, the organization or the project lack well organized policy or guideline that recommends how to manage unexpected uncertainties. In addition to this the project did not established standard risk management process in order to respond for any encounter of risk. More than 50% of the respondents claim that the organization did not designate a specific person or department to handle risk when it occurs. Risk management process was not taken as a continuous task or activity in the project; from all respondent close to 50% of the respondent agreed to the prior statement.

  Risk and Uncertainties that happen within the project is not managed properly. The alternative provided to the respondents are project manager, consultant, client, A specialized risk management team and All teams participating in the Project was not active in engaging to manage occurrence of risk however in the case of risk occurrence all teams participating in the project try their best to resolve the issue.

- Regardless of the risk planning practice most of the respondents respond that there is no systematic approach or a careful planning done to perform risk management in the project. Even if the planning work is poor but it try to incorporate different stack holders in the planning process. Based on the reply of the respondents an expert judgment or meetings are not considered while planning for risks that might occur in the project.

  The risk management of the organization / project consider the whole process continuously. Execution of this activity in the organization done in all steps of the process. The nature of project require to give attention towards the environment where the project is going to be executed. Because of the vital nature a project; Bole Arabsa housing project take in to consideration the environmental factor that has been an issue while planning for uncertainty.

Even if the project considered the environmental factor in the planning it luck provision of tanning for team members in order to able them in handling of risk and uncertainty. Regardless of risk management plan the project do not prepare a separate document rather it included under project plan.

- In Bole Arabsa housing project the process of risk identification did not conducted by all team members but all part of the project cooperatively react to any encounter of risk or uncertainty to the project. Project or organization did not apply any of the five prior listed methods of risk identification but Information gathering method is the one relatively used in the project. The Sources of risk that the project usually encounters are human, technical and financial. From his human aspect of the project is highly susceptible to risk, then technical and finally financial.

- In relation to risk analysis the Characteristics of the risk are not considered before analyzing the identified risk in the project however the project established a measurements system to analyze the risk and to take a corrective action accordingly.

  Revision or Updating of project document after the completion of risk assessment is not considered rather it's totally rejected or no room for any amendment. A continues nature of risk management become a question. As far as technique used in assessing the probability of risks, the project is Appling subjective probability assessment based on expert judgment to determine the risk occurrence but the reaming three methods were not applied in the project.

- Regarding to risk response; There is no a well-developed strategy within the project to respond to risks. Reactive measures are adopted to respond for any incoming occurrence of risk. Even though, risk Factors that affect the performance of the project such as budget, schedule and resources are considered in the time of risk response. Even if the project considered factors it also require to have a strategy to respond for incoming risks; reduction strategy is the one that used the most of the time in the project but it's not the only strategy applied in the project. For instance avoidance, acceptance and transfer strategies used in the project.

  The organization encourages use of contingency plans in order to avoid any situation and also it encourages use of detailed work plans so as to limit occurrence of anything that may delay the implementation of the project. The Performance of the organization in terms of delivering protection and safety systems against any event that may delay the project implementation is weak. However; the organization conduct regular inspections to ensure no issue arises that may delay project implementation but it doesn't seem coordinated. Furthermore, the organization does not arrange training and skill development program that improve altitude and awareness towards ensuring projects schedule. The project outsource activities because of the complex nature of the work and most of the activity may impact the duration of the project**.**

  The organizational culture of an organizations paly crucial role in their successes; however organizations luck this culture in managing project delay factors. For instance insurance coverage in the case of Bole Arabsa housing project was low. Though, the organization enters

into legal agreements especially regarding any event that may cause the project implementation to delay.

Regarding to the organization or project; it conducts periodic meetings with project team to avoid the possible reasons of project delay. The project uses noticeable quality assurance techniques to avoid project delay or addition of time in the project. On the other side the project failed in obeying to signed contract terms and conditions on the issues that may influence the duration of project implementation. In addition to this, the organizational readiness in terms of planning for crisis meetings and disaster recovery plans is low; on the issues that may affect the duration of the project.

The nature of a project require abstinence action. The complex nature of construction industry may affect the schedule, quality and cost of the project. It's recommended to do nothing about it.

- In relation to monitoring and controlling practices of Bole Arabsa housing project; the project doesn't provide sufficient monitoring and controlling work or it shows low concern to it. The performance of the project / organization towards achieving standard and procedure in relation to monitoring, control, & review didn't fulfil the requirement. Similar to the previous points the organization/ project did not use information recorded in the past to take corrective action in relation to risk control. Risks that occur within the project did not controlled in a way that goes with the goal and objective of the project.

- The uses of recognized training method to facilitate and improvement the general knowledge of employee on risk management is highly concerning issue of the organization but it has bad repetition. In relation to the provision of funding to facilitate management of risk is also insignificant. The means of communication that the organization used to address risk to its stakeholders is not sufficient enough or not to the expected level.

5.3 Conclusions

The study carried out to identify risk management practices of Bole Arabsa housing project in Addis Ababa. This conclusion are compiled based on the data collected form the project site and from the findings that presented above.

The level of risk management practice in Bole Arabsa housing project is not to the standard or level of expectation. The project lack well systematized policy or guideline that recommends how to manage uncertainties or risk the time of occurrence. In addition to this the project lacks the application of defined or standard risk management process. The nature of the project require uninterrupted and consistency in handling of risk. However The Generally treatment of risk management process in the organization shows disruptive and uneven nature.

In regarding to identify if there is risk management plan in the projects; in Bole Arabsa housing project there is no systematic approach or a careful planning done to perform risk management in the project. In the other side involvement of stakeholders in the planning process and managing risk are good. Even if the planning process involves stakeholders it miss expert opinion and this make the plan weak in terms of its capacity to respond for different scenarios. The mean value of risk management treated as a continuous process (3.065637) is greater than neutral stand (2.5) risk planning. This implies risk management is a continuous process in the project. Consideration of the environmental aspect in risk planning give context to the risk management plan and this plan included environmental factors in the process of planning. The role of human in risk management process is crucial and it could be constructive as well as destructive. In order to use human for positive purpose organizations required to invest on them and trainings are one of the best technique that could improve the capacity of employee. However in Bole Arabsa housing project luck training. The project incorporated risk management plan in the project plan of the organization.

All team members who are operating under Bole Arabsa housing project are not able to identify occurrence of risk. Expert Judgment, checklist, Document Review, information gathering and Assumption analysis are risk identification methods and none of the five choices are applied in the project. The three Source of risk that the project encounters are Technical, financial and human and from this human are the one that make the project susceptible for risk then technical and financial come accordingly.

In relation to assess how the risks that are identified are analyzed in the projects; the organization do not consider the characteristics of risks in to account before analyzing the identified risk. On the other side, the project developed and used a measurement system to analyze the risk. This help the organization to categories and to take corrective action accordingly. In Bole Arabsa housing project once a risk management plan has been prepared the organization do not make time dependent update to the document and this lead to miss conception and also miss treatment of a problem. Organizations use different technique to assess the probability of risk occurrence in their organization. The most common techniques are quantitative assessments/ numerical analysis, subjective probability assessments based on expert judgment, ranking the importance of risks based on past experience and qualitative assessment based on historical data. Bole Arabsa housing project use only subjective probability assessments based on expert judgment to evaluate occurrence of risk.

In regarding to examine appropriate solution or measures taken; projects by their nature exposed to risk but in order to sustain in the business organizations prepare risk response plan including its strategy. In Bole Arabsa housing project there is no well-established risk response strategy. However the project respond to risk with proper consideration of the different factors. Factors considered in the project are budget, schedule and resource. The project uses reduction, avoidance, acceptance and transfer strategy accordingly in the time of risk occurrence. The organization encourages use of contingency/ alternative plans in order to able the project to respond for different scenario. In addition to this detailed work plans are used to avoid factors that affect the project negatively.

Housing project as a construction project vulnerable to safety and protection risks. But most projects luck safety management and Bole Arabsa housing project is one of them. This project conduct regular

inspections to ensure no issue arises that may delay project implementation. Even if the project perform inspection it lack provision of training and skill development programs. Organization without human resource do not perform any thing. Having specialized human resource in the project make the organization undefeatable in different areas. But organizations/ project like Bole Arabsa housing project don't have all staff to perform all the tasks. Because of this reason the project outsource some tasks to sub contractures that can't be done by internal staff on time. The project benefited from both side tasks properly performed and transfer risk to the third part. However the project do not transfer all tasks to third party because of this the project still exposed for risk. Insurance are risk sharing or transferring agents but the project don't have a clear understanding of insurance coverage and also do not have insurance coverage for the required activates. On the other side the organization/projects enters into legal agreements especially regarding any event that may cause the project implementation to delay.

The organization/ project perform series of schedule based conference and meeting with the project team members to find a solution for the root cause of project delay. Quality assurance is a process of ensure activities in a project can meet quality standards and the project execute quality assurance techniques. On contrary the project shows gap in commitment to execute signed contract terms and conditions on the issues that may influence the duration of implementation. In addition to this, the organizational readiness in terms of planning for crisis meetings and disaster recovery plans on issues that may affect the duration of the project is poor. Construction industry involve different sectors and professionals. This nature of the industry make the task complex to provide minimal solution to it. The complex nature of the sector limit organizations to take actions in some occasions and because this it is best not to do anything about it even if it affect the project duration.

In relation to identify if monitoring and controlling mechanism is applied in the projects; Based on the current performance of the project it's easy to conclude the poor level of execution in regarding to monitoring and controlling work. The objective of monitoring and controlling work is to identify and take corrective action if needed. In addition to this the performance of the project / organization towards achieving standard and procedure in relation to the performance monitoring, control, & review don't satisfy the requirement. Organizations use historical or recorded data to predict the future using trend analysis and this helps them in achieving their goal in different areas. But in Bole Arabsa housing project Information available or the history of the project don't used as a supplement to control risk. Risks that occur within the project are not controlled in a way that goes with the goal and objective of the project. Not only this; risks that occur within the project are not controlled in a way that goes with the goal and objective of the project.

In this project provision of training and skill development to improve the general knowledge of the team member about on risk management is very poor. In addition to this do not provide funding to facilitate management of risks that may delay projects and uses weak means of communication to inform its stockholders. Overall risk management approach used in this organization is poor.

As a conclusion risk management system realized in Bole Arabsa housing project however the level of execution is not to the expectation.

5.4 Recommendations

Based on the findings of the research this section suggests a number of recommendation.

- Addis Ababa City Saving Houses Development Enterprise and project management team are the most responsible government representative for the preparation of proper policy or guideline and preparation of this document enables appropriate practice of risk management in the project.

- Provision of specific department or individual responsible for risk and risk related issues raised on the project and preparation of scheduled report that shows daily base activity performed on the project.
- The Enterprise/organization should conduct a careful planning with proper consultation of experts to overcome uncertain events that may occur.

- The Enterprise/organization should take the advantage of providing training and skill development in order to enable the team members in responding for occurrence of risk and uncertainty.

- The Enterprise/organization should use different risk identification method for example expert judgment, checklist, Document Review, Information gathering & Assumption analysis and assigning of qualified person for the job.

- The Enterprise/ organization should develop strategy to respond to risk and uncertainties and priority of risk response strategy should be reviewed.

- The nature of construction industry require protection and safety systems; the enterprise/ organization should provide required products to safeguard its staff and also should have insurance coverage against any event that may affect the project.

- The Enterprise/ organization should develop strategy or a system that cross check the entire monitoring and controlling process and develop culture that enhance the use of historical data as input for monitoring and controlling of risk.

- Organizational risk management culture can be changed by altering the attitude of employee and organizations should provide recognized training, funding and establish effective communication among employee and stakeholders means.

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Annex 1: Questionnaire

Dear Respondent,

Abebe Demisse is undertaking a research on Assessment of risk management practices on housing project in partial fulfillment of the requirements for the award of Masters of Art in project management of the St.Mary's university. This questionnaire is an important part of data collection in the research. The questionnaire consists of eight sections. It takes approximately 20 minutes to answer the questionnaire.

Outline of the questionnaire:

- The first section shall aim to collect the background information of the respondents, e.g. their age, gender, position, education, work experience and professional background.
- The second section shall include the respondents' general opinion on project risk management.
- The third section shall include an investigation on risk planning and how this task has been managed.
- The fourth section of the questionnaire explores a system which were used by the organization to identify risk.
- The fifth section of the questionnaire address the risk analysis approach applied by the organization.
- The sixth section explores the approach or risk response applied on the project.
- The seventh section explore the way risk monitoring and control had been addressed.
- The eight section of the questioner evaluate the organizational culture of a project in relation to risk management.

Each question is accompanied by an instruction on how to answer it. In order to get an accurate picture of the current risk management practice, it is important that the questionnaire be completed and returned. The questionnaire will be treated as strictly confidential and no reference will be made to companies or persons. As a token of appreciation, the researcher will give a copy of the research proposal to all participants.

Please note that all questions should be answered from the project perspective, not from the general perspective.

Thank you in advance!

Abebe Demisse

Remark this questioner is adopted from Ali.Mohammed (2018).

Section 1: Socio-demographic Characteristics

Instruction: Please indicate your response by filling and ticking on the box provided

1 How old are you? ……..

SN	Questions	Answer/Choices of Respondents	Remark
2	Gender	Male □ Female □	
3	Highest Level of Education	1. high school □ 2. Diploma □ 3. Degree □ 4. Postgraduate □ 5. Other (please specify) □	

4 How many years of work experience in all sectors?.....

5 How long have you worked in a project?.....

Section 2: General Questions about Project Risk Management

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions and tick in the box the letter of your choice for the multiple choice questions that best describes how you perceive the project applies project risk management where: Strongly Disagree (SD) = 1, Disagree (D) = 2, Neutral (N) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
6	There is a policy or guideline that recommends how to manage unexpected uncertainties.	1	2	3	4	5	
7	The project has a defined or standard risk management process.	1	2	3	4	5	
8	Responsible person or department is assigned to handle risk when it occurs.	1	2	3	4	5	
9	Risk management is treated as a continuous process in the project.	1	2	3	4	5	

SN	Questions	Answer/Choices of Respondents (You may choose /tick more than one answer).	Remark
10	Uncertainties that occur within the project are mostly handled by:	1. The project manager □ 2. The consultant □ 3. The client □ 4. A specialized risk management team. □	

		5. All teams participating in the project. □	

Section 3: Risk Planning

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive the project plans for the risks where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
11	There is systematic approach or careful planning done to perform risk management in the project.	1	2	3	4	5	
12	Relevant stakeholders are involved in the planning and performing of managing risk.	1	2	3	4	5	
13	An expert judgment or meetings are considered while planning for risks that might occur in the project.	1	2	3	4	5	
14	Risk management is treated as a continuous process in the project.	1	2	3	4	5	
15	Environmental factors are included as an input to plan for uncertainties.	1	2	3	4	5	
16	Team members within the project receive training or have enough knowledge about how to handle uncertainties.	1	2	3	4	5	
17	Risk management plan is incorporated with the project plan.	1	2	3	4	5	

Section 4: Risk Identification

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive the project identifies the risks where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
18	All team members within the project play a role in identifying risk.	1	2	3	4	5	

19. The following method is primarily used to identify risks within the project: (You may choose /tick more than one answer).

1. Expert Judgment □
2. Checklists □
4. Information gathering □
5. Assumption analysis □

3. Document Review □ 6. None □

20 Sources of risk that the project usually encounters:
1. Technical □ 2. Financial □ 3. Human □

Section 5: Risk Analysis:

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive the project analyze risks where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
21	Characteristics of the risk are considered before analyzing the identified risk.	1	2	3	4	5	
22	There is a measurement system to analyze the risk.	1	2	3	4	5	
23	Project documents are updated after assessment of the risk that might occur.	1	2	3	4	5	

24. Which of the following techniques are used to assess the probability of risk occurrence in the project? You may choose/tick more than one answer.
1. Quantitative assessments/ Numerical analysis □
2. Subjective probability assessments based on expert judgment □
3. Ranking the importance of risks based on past experience □
4. Qualitative assessment based on historical data □

Section 6: Risk Response

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive the project responds to the risks where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
25	There is a well-developed strategy within the project to respond to risk.	1	2	3	4	5	
26	Factors such as budget, schedule and resources are considered while responding to risk.	1	2	3	4	5	

27. The risk response strategy that is usually used in the project:
1. Reduction □ 3. Transfer □

2. Avoidance 4. Acceptance □

Risk Avoidance

This section seeks how your opinion on how the organization you work for utilizes methods of avoiding any events that may delay projects under you as you implement them. Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
28	The organization encourages use of contingency/ alternative plans or in order to avoid any situation that may cause delays in project implementation.	1	2	3	4	5	
29	The organization encourages use of detailed work plans so as to limit occurrence of anything that may delay the implementation of the project.	1	2	3	4	5	
30	The organization has put in place protection and safety systems against any event that may delay the project implementation	1	2	3	4	5	
31	The organization uses regular inspections to ensure no issue arises that may delay project implementation	1	2	3	4	5	
32	The organization has a program on training of employees on how to ensure that projects run on schedule	1	2	3	4	5	

Risk Transfer

The following section seeks how your opinion on how the organization you work for utilizes methods of ensuring that risks did not delay projects under you as you implement them Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions: Strongly Disagree (SD) = 1, Disagree (D) = 2, Neutral (N) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
33	The organization usually outsources some functions especially on those that may impact on the duration of the project.	1	2	3	4	5	

34	The organization buys insurance premium on some items so as to ensure no occurrence will cause a delay in project implementation.	1	2	3	4	5	
35	The organization enters into legal agreements especially regarding any event that may cause the project implementation to delay.	1	2	3	4	5	

Risk Reduction

This section seeks how your opinion on how the organization you work for utilizes methods of ensuring that risks did not delay projects under you as you implement them by minimizing chances of occurrence of an event that may delay implementation of a project. Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	**Questions**	**Scales of Measurement**					**Remark**
		SD	**D**	**N**	**A**	**SA**	
36	The organization conducts periodic meetings with project team to alleviate the possible causes of project delay.	1	2	3	4	5	
37	The organization encourages use of contingency/ alternative plans or in order to avoid any situation that may cause delays in project implementation.	1	2	3	4	5	
38	The organization uses quality assurance technique as a method to ensure that any situation that may cause project delay is eliminated.	1	2	3	4	5	
39	The organization adheres to signed contracts terms and conditions on the issues that may influence the duration of implementation of projects.	1	2	3	4	5	
40	The organization plans for crisis meetings and disaster recovery plans on issues that may affect the duration that the project will take in order to avoid such scenarios.	1	2	3	4	5	

Risk Acceptance

This section seeks how your opinion on how the organization you work for utilizes methods of ensuring that risks did not delay projects under you as you implement them by accepting that there is not much that can be done but to just accept that the risks are likely to occur and the steps that can be taken to prevent are too costly. Please indicate your opinion by marking a circle on the appropriate number for

the five point scale questions: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
41	On some occasions the organization takes no action because it recognizes that though some events may occur and affect duration of the project, it is best not to do anything about them.	1	2	3	4	5	
42	The organization encourages use of contingency/ alternative plans or in order to avoid any situation that may cause delays in project implementation.	1	2	3	4	5	

Section 7: Risk Monitor and Control

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive the project monitor & control to the risks where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
43	Based on the current result of the project are risks monitored and controlled well.	1	2	3	4	5	
44	The Project monitor, control and review the process for risk management to ensure that it complies with standards and procedures.	1	2	3	4	5	
45	Information available or the history of the project is used to supplement to control risk.	1	2	3	4	5	
46	Risks that occur within the project are controlled in a way that goes with the goal and objective of the project.	1	2	3	4	5	

Section 8: Organizational Risk Management Culture

Please indicate your opinion by marking a circle on the appropriate number for the five point scale questions that best describes how you perceive your organization risk management culture where: Strongly Disagree(SD) = 1, Disagree(D) = 2, Neutral(N)= 3, Agree(A) = 4 and Strongly Agree(SA) = 5.

SN	Questions	Scales of Measurement					Remark
		SD	D	N	A	SA	
47	The organization uses a recognized training method to facilitate the improvement of general knowledge on risk management?	1	2	3	4	5	
48	The organization provides funding to facilitate management of risks that may delay projects.	1	2	3	4	5	
49	The organization effectively communicates the risk to the employees or stakeholders (internal and external)?	1	2	3	4	5	

THANK YOU