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Thank you!

Tsehay Zewdie

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List of Acronyms

ECWC: Ethiopian Construction Works Corporation

PM: Project Management

PMBOK: Project Management Body of Knowledge

PMP: Project Management Practice

PRM: Project Risk Management

RA: Risk Acceptance

RAV: Risk Avoidance

RC: Risk Control

RM: Risk Management

RMP: Risk Management

ROT: Rule of Thumb

RMS: Risk Management Strategy

RT: Risk Transfer

SPSS: Statistical Package for Social Science

RII: Relative Importance Index

ABSTRACT

This study is to evaluate and analyze the existing risk management practices employed by ECWC in their construction projects in order to identify areas of improvement and develop strategies that effectively mitigate cost overruns utilizing descriptive research design method. Primary data was gathered from 46 senior professional team members engaged in planning designing and executing construction projects in transport infrastructure, water infrastructure & Building & housing Construction sectors under ECWC using purposive sampling to target specialized employees. A survey was conducted by using 41 structured close ended Likert scale questions which were analyzed using SPSS version- 20 & Relative Importance Index (RII). The findings revealed that the risk management process within ECWC is in its initial stages, indicating that there is a certain amount of risk assessment in each project and there is also department that is responsible for risk management work. However, by strengthening the risk management strategy, the company should work on risk analysis, monitoring processes, implementation of mitigation strategies, communication practices, and integration of risk management with project planning. In addition the above result show inadequate risk management strategy has led to cost overrun for construction projects under ECWC. Finally the research identifies the top five critical risk factors for construction projects covered by the ECWC are: "Delay in payment to supplier/subcontractor; inadequate pre-construction site study; cash flow and financial difficulties faced by contractors; fluctuations in the cost of material; high cost of machinery; fluctuations in the money exchange rate."

Key words: Risk management, Construction project, cost overrun, Critical risk factor & ECWC

CHAPTER I
INTRODUCTION

1.1 Background of the Study

Construction projects are complex and involve various risks that can significantly impact project cost. Adequate risk management strategies play a crucial role in ensuring successful project delivery within budgetary constraints “Effective risk management can help prevent or mitigate time and cost overruns by identifying potential risks early on in project’s life cycle and developing contingency plan to address them Philip Jorion (2006), “Risk management Handbook: A practical Guide to managing the multiple Dimension of Risk”.

Risk management in the construction industry is a critical aspect that significantly impacts project outcomes. These challenges often lead to various negative consequences such as delays, cost overruns, and scope deviations. For instance, a study conducted by Flyvbjerg et al. (2003) on large infrastructure projects found that inadequate risk management was a key factor contributing to cost overruns and delays. Similarly, research by Chan and Chan (2004) emphasized how poor risk management practices can result in significant scope changes during construction projects, leading to increased costs and schedule extensions.

According to a survey conducted in 2012 by a large specific managing authority in Kenya, risk management practices were widely adopted in projects that were deemed complex due to their significant impacts on budgets, communities, economies, and the environment. These projects also attracted a lot of public attention. In contrast, a study conducted in 2014 by ElSayegh in the construction industry of the United Arab Emirates revealed the adoption of risk management procedures, primarily risk identification and quantification, but not at an adequate frequency. Hwang et al. (2014) revealed relatively low usage levels of risk management in small projects in Singapore.

The successful completion of a construction project depends on being ready for potential issues. A solid risk management strategy may both assist managers prevent issues and deal with them when they do occur. As a result, the construction project needs to have a risk management strategy in place. An outline of the project's risks and the steps teams will take to mitigate them is contained in a risk management strategy. A well-written plan will aid in determining what might go wrong on a construction site and how to avoid or lessen such issues in the first place. Planning how teams will handle possible risks or concerns that may

develop during the project, and then putting those plans into action as necessary, is risk management.

Ethiopian Construction works corporation (ECWC) was established eight years ago by merging three big government construction companies with the objective of establishing strong and competitive government Construction Company to handle strategic government projects and stabilize highly inflating construction market. Since its emergence the corporation has performed key government projects and caused to be used for public service. But most of the projects completed beyond of the contract period & over of estimated completion costs.

The study aims to identify the cause of projects under Ethiopians Construction Works Corporation frequently going over budget and behind schedule. This will involve an analysis of company's existing risk management practices, project planning, scheduling, and execution method to understand their effectiveness. "Poor project planning, scheduling and execution can lead to schedule slippage, cost overruns, quality issues, rework, and even projects failure, all of which can result in significant financial losses for the organization (Griling, 2017, p.123).

By identifying the cause of project cost overruns under Ethiopian Construction Works Corporation (ECWC), the proposed research aims to provide recommendation for effective risk management strategies that can be implemented by the corporation to mitigate these challenges. Additionally, the study will contribute to the wider body of knowledge on risk management in construction, with specific focus on controlling construction costs, contributing to the development and implementation of best practice in the field.

1.2 Statement of the Problem

The construction industry works in a somewhat unpredictable environment where conditions can change due to the complexity of each project (Sanvido et al., 1992). Every business wants to be successful, and risk management could contribute to that. Therefore, it is important to note that risk management is a technique that increases the possibility of success rather than providing a guarantee for it. According to Kerzner (2009), risk management is therefore a proactive concept as opposed to a reactive one.

The construction sector plays a significant role in the economy and is frequently regarded as a catalyst for economic expansion, particularly in emerging nations. In most developing

nations, the construction sector typically accounts for 11% of GDP (Giang and Pheng, 2010).One of the problems the Ethiopian construction industry has is the incapacity to apply risk management principles and procedures (Addis, 2014). These could be caused by a lack of experience and understanding in recognizing and assessing the risks of budget and schedule overruns, which results in incomplete projects that are not completed within the allocated funds and time frames.

Construction risk management in Ethiopia is still in its early stages and focuses mostly on a limited set of project management process components. Seleshi (2018), Yimam (2011), and Addis (2014) are a few instances of the numerous studies that look at project risk management practices of Chinese building contractors in Ethiopia, project management maturity in developing country construction industries, and construction contract risk management practices in Ethiopian building construction projects.

The construction industry, particularly in projects under ECWC, often faces the challenge of cost overruns during project execution. Despite having procedures in place to detect project risks, these mechanisms may not always be effective in preventing or controlling cost overruns. The study by Love et al. (2018) demonstrated that projects with ineffective risk management strategies were more likely to experience cost overruns compared to those with robust risk mitigation measures in place. While risk management protocols were indeed implemented, there was a significant disconnect in how these protocols were integrated into decision-making processes. This lack of integration led to an increased likelihood of cost overruns, highlighting the inefficacy of existing risk management practices in the construction industry (Smith et al. (2018).)

One may argue that there is a need for a comprehensive assessment of the current risk management practices within ECWC's construction projects to understand why cost overruns continue to occur despite existing detection procedures. Based on research conducted by Johnson and Brown (2019) examining the alignment between identified risks and the actual occurrence of cost overruns, potential shortcomings or areas of improvement in the risk management strategies can be identified.

Through this assessment, valuable insights can be gained to enhance the company's approach to risk management, ultimately leading to better control of construction project costs and minimizing the impact of overruns on project outcomes. It involved the Ethiopian Construction Works Corporation's three main construction sectors: Building and Housing, water infrastructure, and transportation infrastructure. Therefore, this study seeks to assess

effective risk management process to control construction projects cost overrun in Ethiopian construction Works Corporation.

1.3 Research Questions

The study pursued the following theoretical and empirical research questions in order to respond to this question.

i. What is the existing risk management procedures implemented in construction projects by the ECWC?

ii. What are the specific effects of inadequate risk management on the costs of ECWC's construction projects?

iii. What critical risk factors contribute to cost overruns in ECWC's construction projects?

1.4 Research Objective

1.4.1 General Objective

The general objective of the study is to evaluate and analyze the existing risk management practices employed by ECWC in their construction projects in order to identify areas of improvement and develop strategies that effectively mitigate cost overruns.

1.4.2 Specific Objectives

The Specific Objectives of this research are listed below;

i. To evaluate the existing risk management Procedures employed in construction projects undertaken by the ECWC

ii. To examine the effects of insufficient risk management on the cost of ECWC's construction projects

iii. To analyze & prioritize critical risk factors contributing to cost overruns in construction projects executed by the ECWC

1.5 Significance of the Study

The research titled “Risk Management Practice and its impact on cost in ECWC’s Construction projects” holds significant implications for the construction industry and project management practices. Identifying and understanding the factors contributing to cost overruns in construction projects is crucial for improving project outcomes and ensuring

project success. By conducting a detailed assessment of risk management strategies within the context of ECWC's projects, this study aims to provide valuable insights into how effective risk mitigation measures can be implemented to prevent or minimize cost overruns. This research can contribute to enhancing the efficiency and effectiveness of project management practices within ECWC, leading to more successful project deliveries and potentially serving as a model for other organizations in the construction sector.

Furthermore, the findings of this study could have broader implications for the construction industry at large. Cost overruns are a common challenge faced by construction projects globally, leading to financial losses, delays, and disputes. By focusing on a specific case study under ECWC, this research not only benefits the company internally but also provides a valuable reference point for other construction firms seeking to improve their risk management practices. The insights gained from this study may help industry professionals better understand the root causes of cost overruns, develop proactive risk management strategies, and ultimately contribute to more efficient and successful project delivery across the construction sector.

1.6 Scope of the Study

The study's scope is restricted to only three construction sectors (transport infrastructure, water infrastructure, and building & housing construction sector) under ECWC. This limited scope may not provide a comprehensive view of risk management practices and cost overruns across all construction companies within the country. The findings and recommendations of the study may not be generalizable to other industries or companies outside of the specified sectors under examination.

1.7 Limitation of Study

Focusing solely on projects under ECWC may limit the external validity of the research findings. Different companies may have varying risk management strategies and project management practices that could influence the outcomes related to cost overruns. Therefore, the results may not be directly applicable to construction projects in other companies or industries. This limitation could impact the broader applicability of the study's recommendations and insights for the construction industry as a whole.

1.8 Organization of the research

The research paper has five chapters. The first chapter as shown above discussed deals with introduction, problem statement, objectives, research question, significance, scope &

limitation of the study while the second chapter provides an in-depth theoretical & empirical review of literature on construction project risks, risk management to control construction project cost under different construction projects undertaken at national & international levels. The Third chapter presents the methodology used for conducting this research, the fourth chapter presents results and discussion and finally the fifth chapter presents conclusion & recommendations.

1.9 Definition of Key Terms

Project A temporary endeavor undertaken to create a unique product or service. It is often organized under the direction of Project Manager, who will ensure that the project achieves its objectives.

Project Management it is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements.

Construction industry is an industry which involved in the planning, execution and evaluation (monitoring) of all types of civil works. Physical infrastructures such as buildings, communication and energy related construction works, water supply and sewerage civil works etc. are some of the major projects (program) in the construction industry.

Construction Project is defined as a physical structure that is initiated by the designers' drawings and gets transformed into finished product through a set of methods and processes.

Risk "Any uncertain event or set of circumstances that, should it occur, would have an effect on one or more objectives". (APM)

Uncertainty In distinguishing risk from uncertainty, risk can be viewed as measurable uncertainty; and uncertainty as immeasurable risk. Uncertainty is a mere intellectual curiosity and only becomes a risk when it matters. This clarifies the fact that not all uncertainty is a risk, though risk is always uncertain.

Risk management is the systematic process of identifying, analyzing, and responding to project risk. It includes maximizing the probability and consequences of adverse events to project objectives.

CHAPTER II
REVIEW OF RELATED LITERATURE

2.1 Introduction

This part of the study contains descriptions and explanations given by different authors and researchers obtained from different documents and research findings of several studies. This review of literature contains about the concepts and dimensions of construction project risks, effective risk management strategies to control construction project cost, measurements used to measure the effectiveness of the current risk management strategies in controlling construction project costs, and most common construction risks associated with complex construction projects.

2.2 Review of theory's

The theoretical study outlines the fundamental concepts of project management and project risk management, as well as the tried-and-true methods that should be used to successfully accomplish project goals and objectives in dangerous and unpredictable project environments. Beginning with a focus on project management, this examination goes into detail into the success impacts of risk management**.**

2.2.1 Project and Project Management

A project is a temporary and non-repetitive endeavor, characterized by a clear and logical sequence of events, with a beginning, middle, and end, focused on the accomplishment of a clear and defined objective on deadline, with costs, resources, and quality parameters specified (Vargas, 2008). It is also characterized as a difficult, non-routine, one-time endeavor to fulfill client demands that is constrained by time, budget, resources, and performance standards.

Project management is defined as the application of knowledge, skills, tools, and procedures to project activities in order to achieve project requirements. (Charvat, 2003) Defines project management as a set of tools, techniques, and knowledge that, when applied, helps to achieve the three main constraints of scope, cost and time. Project management is only possible when the methods selected for the project are used correctly and integrated. With the use of project management, organizations may complete projects efficiently and economically (PMI, 2013). PM is also defined by PMI (2003) as the application and integration of logically grouped processes that are divided into five stages: initiating, planning, executing, monitoring &

controlling, and closing, all of which are carried out within a given scope, quality, schedule, budget, resources, and risk.

2.2.2 Risk & Project Risk Management

Risk is everywhere. It is a common and unavoidable event. Each of us must deal with danger, albeit some do so more regularly and voluntarily than others (Kerzner, 2009). While some people are perpetual risk averse, others actively seek it out (Hamid A., 2005). We are constantly exposed to risk, yet we are not always fully aware of it, nor do we always react to it wisely or efficiently (Ekateria O., 2008).

One of the nine PM knowledge areas is risk, which is defined as an uncertain event or circumstance that, if it materializes, may have a favorable or unfavorable impact on a project objective (PMI, 2000). A risk is an uncertain occurrence or group of events that, if they take place, would have an impact on the project's ability to achieve its goals (APM, 1997). It is important to emphasize that risk is best defined in this context as an unknown effect on project performance rather than as a cause of a (uncertain) effect on project performance. According to Hamid (2005), a project's "risk" is defined as "the implications of uncertainty about the level of project performance achievable."

Project risk management entails a number of steps, including risk management planning, identifying and assessing risks, and implementing risk management controls. PRM deals with the processes of ensuring a proper risk identification, analysis and control during different phases of project. It enables the project team to take proactive responses and control the impact of risk events (PMI, 2017). It has been identified that the risk factors should be dealt with in the early phases of a project if risk management is to be effective (Hussein & Karimin, 2006). By measuring and integrating the likelihood of occurrence, project risk management focuses on recognizing which risks may have an influence on documenting the project's features, ranking risks for further analysis or actions, and prioritizing risks for further analysis or actions. Therefore, effective risk management is crucial to fulfilling the aims and objectives of such a risky construction industry.

The construction company is encouraged to identify and evaluate risks as well as think about risk containment and risk reduction strategies using an efficient risk management approach. Construction firms that effectively and efficiently manage risk benefit from increased productivity, lower costs, higher success rates on new projects, and better decision-making. (Sharon S., 2014). In the context of managing construction projects, RM is a thorough and

organized method of locating, evaluating, and dealing with risks in order to meet project goals. According to research findings by Audrius B. et al. (2012), the construction companies surveyed significantly differ from the construction companies in other countries in their adoption of risk management practices. In order to manage risk effectively and efficiently, the contractor must comprehend risk responsibilities, risk event conditions, risk preference, and risk management capabilities.

In order to identify any additional risks that the solutions may have introduced, the responses to risks are examined. A successful risk management strategy involves regularly identifying risks and evaluating their relative relevance. (Hamid, 2005). Project management is essentially risk management; according to Turner's (2009) view. Dealing with risks is the act or practice of risk management. Planning for risk, identifying risks, assessing risks, creating risk response plans, monitoring and managing risks to track changes, and controlling risks are all included. Additionally, effective risk management aims to raise the likelihood that the project will succeed by being proactive rather than reactive, positive rather than negative. 2009's (Kerzner).

The risk management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, identifying, and analyzing, assessing, treating, monitoring and communicating risk. The project risk management process applies across all project phases, and projects that arise at all phases of the asset life cycle.

Stages of Project Risk Management

Figure: 2.1 1Stages of Project Risk Management

2.2.3 Risks in Construction Projects

Risk is defined as the possibility that a specific event or set of related events will transpire during the course of the construction process in the construction industry. The accumulation, or combinations of risks can be termed project risk and the construction industry is often considered as a risky business due to its complexity and strategic nature. It incurs numerous project stakeholders, influenced by internal and external factors which will lead to enormous risks (Smith, Merna and Jobling, 2007:1; Renuka, Umarani and Kamal, 2014: 31).

The construction sector has a very bad reputation for handling change's negative consequences; numerous projects have a history of exceeding budget, quality, and schedule targets. This is not too surprising considering that there are no known perfect engineers, or managers any more than there are perfect designs or that the forces of nature behave in a perfectly predictable way. Although it is impossible to completely eradicate change, engineers and project managers can better manage it by using the concepts of risk management (Smith, Merna, and Jobling, 2007:1). A project risk can be classified as either the overall project risk or as an individual risk related to a specific project activity. Individual risks and opportunities are those that could have a favorable or unfavorable impact on one or more of the goals of the project tasks. Identifying and comprehending specific risks can assist in formulating an effective plan for allocating resources and efforts to maximize project success. Overall project risk refers to the effect of uncertainty on the project. To lead to successful achievement of objectives is necessary to set realistic targets for the cost and duration of a project (Dan et' al, 2011:147).

2.2.4 Types and Sources of risks in Construction

Even if they have common ground, different scholars and researchers categorize risk in several ways. According Nadeem et' al (2010:18), risk can be associated to technical, operational or business aspects of a project. Based on our strategy, risk can be either acceptable or unacceptable. In addition based on their impact duration, risks can either have short term or long-term impact. Additionally, risks might be classified as manageable or unmanageable. It is possible to accommodate a controllable risk, such as a little modification to the project's requirements. Conversely, an unmanageable risk—like the departure of important team members—cannot be accepted. Risks can also be classified as internal or external depending on where they originate from. An internal risk is specific to a project and arises from sources that are part of the project itself; one such source could be a product's

malfunction. On the other hand, an external risk originates from sources beyond the project's scope, like senior management's decision to reduce costs. Moreover, risk factors associated with the construction industry can broadly categorize into:

- Technical risks
- Logistical risks
- Management related risks
- Environmental risks
- Financial risks, and
- Socio-political risks

Renuka, Umarani and Kamal (2014:33), attempt to generalize the critical risk factors listed by many researchers in different projects like residential, industrial, commercial, and infrastructure in a unique way which include:

- Country risk (Inflation, country economic condition)
- Environmental and geological risk (weather and climatic conditions)
- - Statutory Compliance Risk (has to have approval from lawmakers prior to project development)
- Design risk (scope and design changes)
- Project Execution risk (modern technology implementation, poor safety procedures, construction delays, inadequate managerial skills, team improper coordination); &
- Resource Risk (lack of availability of resources)

2.2.5 Risk Management Strategy

2.2.5.1 Planning Risk Management

Deciding how to approach and organize the project's risk management operations is known as risk management planning. According to the Project Management Body of Knowledge (PMBOK Guide, 11.1), planning risk management is the process of creating and documenting an organized, thorough, and interactive strategy and methods for identifying and analyzing

risks, creating risk response plans, and monitoring and controlling how risks have changed. It also refers to choosing how to approach and plan the risk management activities for a project.

2.2.5.2 Risk Identification

Project Risk Identification is the process of determining which risks may affect the project and documenting their characteristics. It is also a structured & consistent approach to the identification of potential risk events. The method of identifying and documenting the related risk involves analyzing the program areas and each crucial technical procedure (PMBOK Guide, 11.2). Finding, identifying, and describing hazards are all part of the process (Kerzner, 2009). Since unidentified hazards cannot be systematically handled, a successful risk identification procedure is essential to effective risk management (Richardson, 2015). Still, they pose risks. Therefore, it is beneficial for any organization interested in putting an RMS into place to take the time to consider how to do so (PMBOK Guide).

The aim of the risk identification stage is to "Generate a comprehensive list of risks based on those events that might create, enhance, prevent, degrade, accelerate, or delay the achievement of objectives".

2.2.5.3 Risk Analysis

Risk analysis is the systematic process of estimating probability of occurrence and magnitude of impact for each risk event from Step. Examine each risk that has been found in order to determine its likelihood and foresee its effects on the project. It incorporates both qualitative and quantitative risk assessments (PMBOK Guides 11.3 and 11.4).

- **Qualitative risk analysis: -** is the process of determining the possibility and impact of hazards that have been identified. Risks are ranked in this procedure based on how they might affect the project's goals. It is one method of figuring out how crucial it is to handle particular risks and provide direction for risk actions (PMBOK Guide 11.3).

- **Quantitative risk analysis: -** seeks to quantify the likelihood of each risk, its impact on the project's goals, and the level of overall project risk. (11.4 In PMBOK Guide).

2.2.5.4 Risk Responses

Risk response is the procedure for determining, assessing, choosing, and putting into practice one or more solutions to set risk at acceptable levels given program limits and goals (Kerzner,

2009). This covers the specifics of what has to be done, when it needs to be done, who is responsible, and the costs and timeline involved (Ekaterina, 2008). A risk or opportunity response strategy is made up of a decision and an implementation plan. Risk reactions might include acceptance, avoidance, mitigation (also known as control), and transfer. Opportunities can be taken advantage of by accepting, improving, utilizing, and sharing them. Then, for the response option that is thought to be the most appealing, a special implementation method is developed.

- **Risk Acceptance/ RA (i.e., Retention):-** This approach to risk response entails recognizing a risk, recording all relevant risk management data, and waiting to take any action until a risk occurs.

- **Risk Avoidance/ RAV:-** This risk response strategy is about removing the threat by any means. That can mean changing your project management plan to avoid the risk because it's detrimental to the project.

- **Risk Control/ RC (e.g., Mitigation):-** Certain risks associated with projects are unavoidable. Those that require mitigation, or lessening the detrimental risk's influence on the project.

- **Risk Transfer/ RT** :- As the name implies, here you'll transfer or pass the work on resolving the project risk to a third party, such as buying insurance or getting a warranty and guarantee.

There are instances when risk carries both an opportunity and a threat. There are a few risk response techniques you can use in the situation:

Accept: In this scenario, you acknowledge the risk and bide your time until a suitable solution, such a backup plan or a time and money allotment, can be decided upon. Stakeholders need to be informed of this decision.

Escalate: A risk is raised to a higher level, such program or portfolio management, if it cannot be tracked and is outside the purview of the project management.

Table: 2.1Summary of Risk Responses Options

Type of Response	Use for Risk or Opportunity	Descriptions
Avoidance	Risk	Eliminate risk by accepting another alternative, changing the design, or changing a requirement. Can affect the probability and/or impact.
Mitigation (control)	Risk	Reduce probability and/or impact through active measures.
Transfer	Risk	Reduce probability and/or impact by transferring ownership of all or part of the risk to another party, or by redesign across hardware/software or other interfaces, etc.
Exploit	Opportunity	Take advantage of opportunities.
Share	Opportunity	Share with another party who can increase the probability and/or impact of opportunities.
Enhance	Opportunity	Increase probability and/or impact of opportunity.
Acceptance	Risk and opportunity	Adopt a wait-and-see attitude and take action when triggers are met. Budget, schedule, and other resources must be held in reserve in case the risk occurs or opportunity is selected.

(Source: Kerzner, 2009, pg.784)

2.2.5.5 Risk Monitoring & Planning

Throughout the acquisition process, the systematic monitoring and assessment of risk response actions against predetermined metrics takes place. It also serves as input for modifying risk response plans as needed (PMBOK 11.6.). This involves tracking remaining risks, spotting new ones, ensuring that risk plans are carried out, and assessing how well they work to reduce down on risks. (PMBOK 11.6). The knowledge book states that risk monitoring and control is a continuous process throughout the duration of the project. This is due to the fact that as a project evolves, new risks emerge or previously predicted dangers vanish.

2.2.6 Risk Management Strategies and Construction Project Costs

Construction projects are inherently complex undertakings, characterized by numerous risks that can significantly impact project costs. Effective risk management is crucial for mitigating these risks and maintaining cost control. In this empirical review, we aim to assess the current state of research on risk management processes in construction projects, focusing on their ability to influence cost outcomes. Risk management plays a vital role in construction projects by identifying, assessing, and prioritizing potential risks and implementing strategies to mitigate their impact on project costs (Chang et al., 2013). Construction projects are exposed to various types of risks, including technological risks, operational risks, financial risks, and external risks (Chen et al., 2015). These risks can lead to cost overruns, schedule delays, and even project failure if not properly managed.

2.2.6.1 Risk Management Processes in Construction Projects

Several risk management processes have been proposed in the literature to help control construction project costs. One such process is the Plan-Do-Check-Act (PDCA) cycle (Deming, 1986), which involves planning for risk identification and assessment, implementing risk mitigation strategies, monitoring risk outcomes, and adjusting strategies as needed. Another process is the Early Warning System (EWS) approach (Ballard et al., 2008), which focuses on proactively identifying and addressing potential risks before they escalate into major issues.

2.2.6.2 Resource Risk Management Strategies

Panigrahi et al. (2014) categorize financial risks as including cash flows, working capital, credit ratings and interest rates. Maintaining a constant and timely supply of resources is essential to reducing resource risks. Poor material quality or variable availability of material meeting standard criteria are examples of material risks. While capital equipment risk represents the suitability of existing construction technology and associated expenses, which is typically an issue for many contractors, land resource risk is related to the ground and site conditions.

2.2.6.3 Personnel Risk Management Strategies

One of the risk management strategies that were found was the requirement for project staff to receive training on sustainable risk management techniques, with a greater focus on the

time and other advantages of efficient risk management. Such training was geared towards demonstrating the implementation of risk management strategies as an investment that would result in positive outcomes, thus changing the negative perception of overall risk management as an unnecessary and costly undertaking (Goh & Abdul-Rahman, 2013).

Goh and Abdul-Rahman (2013) conducted an investigation into the identification and management of major risks in the Malaysian construction industry. The primary goals of this study was to find out the key risks in the industry and evaluate what measures the stakeholders had implemented to respond to these risks. The study's conclusions showed that the main risks encountered in terms of frequency and effect on the projects were financial and time risks. This was mostly brought on by a lack of experience in risk management as well as the high expenses associated with putting sustainable risk management techniques into practice.

2.2.6.4 Project Control Risk Management Strategies

Meredith and Mantel (2006) define control systems as feedback loops whole role is to inform management on variations between actual and desired performance. The feedback loop, according to Moselhi, Li and Alkass (2004), provides information that enables comparisons between planned and actual performance in terms of cost, time and quality. Project control systems are key to ensuring timely revision of project activities, to avoid deviations that may impact adversely on performance. An efficient control system is characterized by an accurate measurement system, given that the accuracy of information provided by the feedback loop determines the cost, time and quality performance of the project. A review of the empirical literature has identified studies conducted in relation to control risk management and firm performance. Ling and Ang (2013) conducted a study that involved identifying project control risk management strategies that were crucial in determining effective project performance among Singapore based construction firms. Their research was a survey that deployed an online questionnaire and used electronic mail for data collection. They identified a total of sixteen project management control risk management strategies that correlated significantly with project performance. The key control risk indicators identified included quality of techniques that enabled proper risk identification, adequacy of time float in the schedule, and relevance of information necessary for developing the time schedule.

2.2.6.5 Litigation Risk Management Strategies

Bayliss (2002) observed that stakeholders in the construction industry normally solve day to day disputes easily, but complex issues tend to end up in courts where the lengthy litigation process results in unwanted cost and time overruns. These lengthy and expensive legal procedures eventually negatively affect firm performance. Construction projects, just like in any business, are subject to disputes and this need to be addressed speedily to avoid adverse impacts on construction firm performance. The risk of litigation, which then results in massive cost and time overruns, has increasingly resulted in a shift towards out of court settlements. This has led to the emergence of alternative dispute resolution mechanisms that are used at any stage in a construction project, ranging from routine dispute resolution to binding arbitration. For example, Jannadia, Assaf, Bubshait and Naji (2000) conducted a survey designed to examine the suitability of contractual methods towards Dispute Avoidance and Resolution (DAR) for industrial projects in Saudi Arabia. The intention was to gauge their attitude towards recommended contractual approaches for DAR during actual construction implementation. These recommended contractual approaches towards DAR were allocating fair contract risk, drafting dispute clauses, team building, provision of a neutral arbitrator, and binding arbitration.

2.2.6.6 Insurance Risk Management Strategies

In practice, construction firms mainly adopt three strategies for risk transfer, these being through insurance, sub-contracting or through modifying contract conditions. Among these three, obtaining insurance is the most widely utilized technique for transferring risk. Insurance is defined as the fair transfer of risk of a potential loss from one entity to another (usually an insurance firm) in exchange for a premium by Martz Jr., Neil, and Biscaccianti (2006). The entity that acquires insurance coverage is known as the insured, whereas the insurer is the one who offers it. Insurance covers are based on good faith between all the parties involved and this requires the insured to make full disclosure of all relevant facts that are known to them.

2.2.6.6 .1 Policy and Regulatory Framework, Risk Management

The goal of a research study done in Turkey by Isik et al. (2010) was to look at how exogenous influences affected the strategic performance of construction enterprises. The research technique included in-person interviews with 185 construction firms as well as email questionnaires. The exogenous factors under examination were categorized into market

conditions and strategic alliances. Market conditions included those aspects of the business environment that the firm could not easily influence. These included the role of government, legal conditions, and the political scenario. The findings indicated that these parameters influenced the strategic performance of the construction firms through impacting on the differentiation strategies, and market/project/partner selection strategies. Punitive government regulation also impacted negatively on the ability to differentiate through the use of innovative construction methods, materials and equipment by sanctioning the use of new technologies. Political conditions turned out to be the most influential and tend to suggest that it is difficult to make strategic decisions in developing countries like Turkey where political stability is often questionable (Isik et al., 2010).

2.3 Empirical Literature Reviews

Numerous studies have investigated the relationship between risk management processes and cost control in construction projects. For instance, Chang et al. (2013) found that effective risk management practices were associated with lower cost overruns in large-scale infrastructure projects. Similarly, Chen et al. (2015) reported that the implementation of Early Warning System (EWS) led to significant improvements in cost control for a construction company. However, other studies have highlighted challenges in implementing these processes effectively due to factors such as organizational resistance and lack of resources (Alkahtani et al., 2017).

Existing literature has highlighted the importance of conducting risk management assessment to evaluate risk management process and strategies (Nocco & Stulz, 2006; Franke et al., 2013). Such assessment can help identify gaps in the organization's risk management and there by developing suitable measures to improve the company's overall risk management practice (Kwak, Hong, & Lee, 2017). Moreover, several studies have also emphasized the importance of effective communication among stakeholders involved in risk management activities for better understanding and decision making (Beggan et al., 2019; Fotopoulos et al., 2020).

Moreover, several researchers have recently highlighted the role of technological tools such as artificial intelligence and machine learning algorithms in improving risk management practice in organization (Marinelli, pascucci, & Ricci, 2021, Aven & Schjolberg, 2018). Such technologies can help predict and detect potential risks more informed decision. Overall, No research has been conducted concerning the assessment of risk management in ECWC. An

empirical investigation to explore the current risk management practices within ECWC, their efficiency & identification of areas of weakness could provide deductions to ward better risk management practice.

According to Flyvbjerg, Holm, and Buhl (2003), implementing risk management in construction projects is crucial for maximizing value added throughout the value chain, guaranteeing adherence to best practices, and reducing waste and inefficiencies. Risk management of construction projects thus optimizes shareholder value on all activities along the value chain and maximizes overall profitability. This is mainly through minimizing or eliminating the potential adverse impact of uncertain events that may affect achievement of the project objectives. Flyvbjerg et al. (2003), further observe that effective risk management increases value through adherence to budget, adherence to schedule, and conformance to quality expectations, among other measures.

One of the main causes of claims and disputes in construction projects is the occurrence of risks that were not well analyzed or integrated by clients, contractors, or consultants, according to research done by Ojo (2010) on claims and contract disputes in a number of construction projects in Nigeria.

According to a 2014 study by Bowers and Khorakian, relatively little information is available about the effective application of risk management systems in the majority of developing nations' construction industry. According to (Lyons and Skitmore, 2004), brainstorming is the most widely used risk detection technique in the engineering and construction industry. Among several others; probabilistic analysis, sensitivity analysis and decision trees are some of the risk analysis techniques used in Australia.

Chen, Hao, Poon, and Ng (2004) looked into the matter of managing cost risk in the Hong Kong West Rail Project. In this case study, the researchers categorized fifteen potential risks into three clusters: resource factors, management factors, and parent factors. These risks were expected to have an impact on project costs. The results showed that resource problems such as material price increases, and management factors, such as inaccurate cost estimates and supplier or subcontractor default, were the main causes of cost escalation in this project. One of the parent factors in project management was the over-interface. Chapman and Ward (2004) conducted a study whose main aim was to find out how risks were managed in the construction industry in India and whether stakeholder relationships influenced project success. The methodology employed a case study approach and relied largely on in-depth

interviews with key project stakeholders, such as the project managers, supervisors and the main supplier. The findings indicate that risks arising from the construction project itself can be managed through application of risk management models.

Odeyinka, Oladapo & Akindele (2006) examined “Assessing Risk Impacts on Construction Cost” and checklist of risk factors and questionnaire survey used to carry out investigation to determine their relative importance. Construction practitioners in contracting organizations, consultancy firms and Government organizations were among the participants. The survey result showed that the major risk factors inherent in constructing were financial, political, physical, and construction respectively that have impact on construction cost.

The researcher from two Gulf countries—the State of Kuwait and the Kingdom of Bahrain—are the focus of the study "Identification and assessment of risk factors affecting construction projects," which aims to identify and evaluate risk factors during the construction phase of projects in the region (Altoryman, 2014). Contractors, consultants, and clients were given questionnaire surveys, interviews, and other research tools. The study demonstrates that both countries agreed that the financial category was the primary element endangering project completion when it came to the perception of risk factors at the category level.

In their study "Nature of The Critical Risk Factors Affecting Project Performance in Indonesian Building Contracts," Wiguna & Scot (2005) looked into the risk factors that lead to schedule and cost overruns in building projects in Indonesia. The study was mostly based on interviews with project managers using a structured questionnaire that assessed twenty-two building projects in order to determine risk levels in terms of time and cost.

The following were determined to be the most crucial factors: high price inflation; defective design; design changes by owner; delayed contract payments; inclement weather; unforeseen site ground conditions; poor financial regulation; substandard building work; late delivery of workshop drawings; and difficulties in with accessibility of skilled and unskilled worker, material, and equipment. Additionally, it demonstrated how the building contractors' disclosure of the important risks impacting the project budget and schedule is related.

Chileshe (2012) investigated "An Evaluation of Risk Factors Impacting Construction Projects in Ghana" in order to investigate the likelihood and extent to which risk issues could affect construction projects within the Ghanaian construction industry. Twenty-three owners, forty-six consultants, and thirty-four contractors participated in a survey in which respondents were

selected at random.

According to the results of their (the experts') investigation, there is a disparity in how participants assess the degree of recurrence and influence. The findings, however, show that all three participants completely agree on how to rate the financial risk element "delay in payment" in relation to the severity of the risk impact.

Study conducted by Getachew Tesegaye 2009 and Addis Mesfin 2009 researches on risk management of road projects and building projects of Ethiopia indicated that road and building construction projects don't use risk management techniques in their projects because of lack of awareness about their significance and some don't use them fearing they need to hire additional staff and acquire more resources.

Furthermore, Wiguna & Scot (2005) investigated to draw conclusions about the risk factors causing schedule and expense overruns in Indonesian building projects in their study "Nature of The Critical Risk Factors Affecting Project Performance in Indonesian Building Contracts." The study was mostly based on structured questionnaire-based interviews with project managers to evaluate risk levels in terms of time and money. 22 construction projects were examined.

The following were determined to be the most crucial factors: high price inflation; poor design; owner-initiated design changes; delayed contract payments; adverse weather conditions; unforeseen site conditions; inadequate financial oversight; subpar construction work; delayed delivery of workshop drawings; and challenges in obtaining competent and unskilled labor, supplies, and equipment.

2.4 Gap Analysis

The construction industry has been the focus of a lot risk management research over the past forty years (Forbes et al., 2008). This research has assumed that construction projects are visible to risk from the moment they are created (Schieg, 2006) and are observed to have more essential risk due to the involvement of numerous contracting parties, including owners, contractors, and designers (El-Sayegh, 2008 One of the main causes of claims and disputes in construction projects is the occurrence of risks that were not well analyzed or integrated by clients, contractors, or consultants, according to research done by Ojo (2010) on claims and contract disputes in a number of construction projects in Nigeria. A study by Bowers and Khorakian (2014) found that very little information about the effective application of risk

management systems is known in the majority of the construction industry in developing nations.According to (Lyons and Skitmore, 2004), brainstorming is the most widely used risk detection technique in the engineering and construction industry. Among several others; probabilistic analysis, sensitivity analysis and decision trees are some of the risk analysis techniques used in Australia. Researchers in Qatar have identified a common problem shared by contractors and most owners: a lack of knowledge about risk mitigation and preventive strategies. Additionally, the manipulation of risk analysis approaches is absent and generally they rely on the subjective prudence utilizing past experience in time and cost estimation According to Getachew Tesegaye 2009 and Addis Mesfin 2009 researches on risk management of road projects and building projects of Ethiopia indicated that road and building construction projects don't use risk management techniques in their projects because of lack of awareness about their significance and some don't use them fearing they need to hire additional staff and acquire more resources.

The assessment of risk management in company is an important factor to ensure the organization's success and sustainability. Previous studies have emphasized the significance of effective risk management practice of effective risk management practice to mitigate negative effects or risks such as financials losses, reputation damage, and compliance violation (Hillson & Murray-webster, 2012; Viitala & Maunula, 2015).

However, there are limited empirical studies that investigate the assessment of risk management in companies, particularly no studies in ECWC. But existing construction projects carried out under ECWC cannot be risk free and needs evaluation to assess risk management practice in order to reduce the consequence of the risks. As a gap this research will study risk management to control project costs & to improve the performance of construction in the projects under ECWC. It will identify the risks causing cost overrun, time overrun and quality deviation as well as investigate effective risk management strategies help to control construction project costs. Therefore, the focus of the study is to investigate risk management to control construction project costs, assess existing construction risk management practice, assess cause and impact of construction risk and evaluation of risk allocation mechanisms from professional's perspective.

CHAPTER III
RESEARCH DESIGN AND METHODOLOGY

This chapter deals with the research methodology. It entails the various research methods available and the particular one used in this study. The chapter explains the type & sources of research data, procedures for data collection and methods employed for data analyze, moreover it explains ethical issues and measurement reliability parts of the study.

3.1 Research Approach

According to Creswell (2003), there are three identified categories of research approaches; qualitative, quantitative and mixed approach. It is incorrect to think of qualitative and quantitative methods as hard, binary, or polar opponents. Rather, they stand for various extremities on a continuum (Newman & Benz, 1998). More often than not, a study is qualitative rather than quantitative. Because mixed methods research combines aspects of qualitative and quantitative methodologies, it falls in the middle of this range. In order to attain the objective of the study and answer the research questions, both quantitative and qualitative (Mixed) research approach were used.

3.2 Research Design

The choice of research design depends on objectives that the researchers want to achieve (Admas et al., 2007). In the literature on research methodologies, the three categories of exploratory, descriptive, and explanatory research purposes are most frequently utilized. If the study is mainly on portraying a profile having a clear picture of the phenomena on which you wish to collect data prior to the collection of the data, descriptive design takes the lead.(Robson 2002:59). The research implemented descriptive research design in order to describe the situations and facts to the research questions of this specific study. It made it possible to gather information, evaluate, suggest, and understand it in order to create an accurate profile of risk events.

3.3 Population of the Study

Population is defined as ‘units that have the chance to be included in the survey sample’ (Groves et al., 2009). The number of samples from the population was determined by taking into account the employees of the three construction sectors under ECWC (Transport infrastructure, building & housing, and Water infrastructure construction) who work as team

members in carrying out the planning, execution activities, and support & follow-up of the construction projects. Hence, an average of 16 members of this group is chosen for each sector, for a total of 480 target populations. The professionals in the team, comprising senior project managers, top managers, and field experts with greater familiarity with ECWC construction projects, constituted the sample.

3.4 Sample Size & Sampling Techniques

There respondents had to be selected in such a way that they should be appropriate and /or with expertize directly or indirectly related to the planning, designing and /or executions of the projects. Purposive sampling is to pick out the sample in relation to some criteria important for the particular study (Singh, 2006). Purposive / judgmental sampling is often used when working with small population and enables us to select cases that best fit to answer the research questions and meet objectives (Saunders et al., 2009). In special situations the use of a purposive sample is chosen as the form of data collection (Neuman, 1997).

Hence, according to the suggestions above, in this study, the purposive sample provided the means to investigate a specialized population of the employees in the construction projects/sectors under ECWC who are involved in the planning, designing and executions of the project. Therefore, based on information gathered from the Human resources files of the relevant Sector, each sector has, on average, 160 members of this type of person; this adds up to 480 target populations. Next, sample size was determined by adopting the Curry (1984), Professor of Educational Research's "rule of thumb" on sample size determination. (See Table.3.1. below)

Table.3.1. Dr. John Curry's "Rule of Thumb" on Sample Size Determination

"Rule of Thumb"	Range of Population Size(N)	Sample Size as a Percentage of Population(S)
RT-1	The larger the population size, the smaller the percentage of the population required to get a representative sample	
RT-2	0-100	100%
RT-3	101 - 1000	10%
RT-4	1001 - 5000	5%
RT-5	5001 - 10000	3%
RT-6	Above 10000	1%

(Source: J.Curry, 1984, with some modifications)

The target population size, which were anticipated to number 480, are the team members who

directly participate in project execution as well as those who are involved in project planning and design. Thus, in accordance with Rule of Thumb number 3 (RT-3), a sample size of 48 was selected, representing 10% of the target population. Additionally, 48 questionnaire booklets 16 for each sector will be given to employees of those Sectors

- **Data Collection Instrument**

The success of any questionnaire survey and the accuracy of data collected largely depend on the careful design of the questionnaire's contents, structure and form of response (Akintoye et al., 39 2000). It should adequately capture all the information need to address the research objectives (Dunn & Huss, 2004). The questionnaire was used because they are straight forward and less time consuming for both the researcher and the participants (Owens, 2002). A Likert scale questionnaire is a popular data collection instrument used in research to measure attitudes, opinions, and perceptions of respondents towards a particular topic. This research used Closed-ended Liker scale questionnaires for this study. The questionnaire divided into three main parts having a complete of 43 questions. Part I solicited general information about respondents; part II and part III are made up of closed-ended Liker scale questions to survey ECWC projects risk management practice & risk factors which influence Construction project cost.

Before distributing the final questionnaire to respondents to collect data, it checked by the research advisor. Then Pilot survey of (15) conducted for testing to evaluate the validity and probable reliability of the questions. Hence, feedback was included on the questionnaire and survey techniques and improved.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.845	.835	35

(Source: Own survey results, May, 2024)

- **Data Collection Procedures**

The researcher assumes responsibility for gathering pertinent information from the intended respondents in order to obtain primary data. The three construction sectors (Transport infrastructure, Water infrastructure & Building & Housing construction sector)

included in the ECWC have all been covered in this study. In order to accomplish this, the researcher has asked the Sector Deputy CEO for permission to share the relevant project management team member and senior expertise in main office. Following this, the researcher has discussed with the relevant departmental higher officials by explaining the goal and advantages of the study. In order to provide respondents enough time to complete the surveys and gather them from every employee, the researcher also distributed the questionnaire to the chosen employees and gave them ten days to respond.

3.5 Method of Data Analysis

Following the data collection phase, the data gathered via questionnaire processed via Statistical Package for Social Sciences (IBM SPSS statistics 20). The risk management process of the company has analyzed using the above software and the rest quantitative data analyzed using descriptive statistics such as frequency distribution, percentage, table and graph.

Furthermore, the "Relative Importance Index" (RII) approach was utilized to assess the answer about the rating and impact level of every risk factor, taking into account the mean scores obtained (Szymanski, 2017). Using a five-point Likert scale, Akadiri (2011) developed a system for scoring the variables in order to analyze and identify the hierarchical risk factors. It also assesses the degree of influence of each element. The Relative Importance Index (RII) is a statistical method used in research to determine the relative importance of variables or factors in a study. It is often used in academic research writing to prioritize or rank various factors or variables based on their perceived importance as rated by respondents. Researchers typically use the RII in academic research to analyze survey data where respondents are asked to rate the importance of various factors on a Likert scale. The RII helps researchers identify and rank the most important factors according to the respondents' perception.

The RII value has a range of zero (inclusive) to one. The classifications are as follows: low (0<RII<0.2), medium-low (0.2<RII<0.4), medium (0.4<RII <0.6), high medium (0.6 <RII< 0.8), and high level (0.8< RII<1). Equation (3) below displays the formula used to compute the RII.

$$\mathbf{RII} = \frac{5(n5) + 4(n4) + 3(n3) + 2(n2) + (n1)}{5(n1+n2+n3+n4+n5)} \quad \ldots\ldots (3)$$

Where n1, n2, n3, n4, and n5 are the number of respondents who selected 1, for insignificant, 2, for low, 3, for Neutral 4, for High , & 5, for Very High correspondingly.

3.6 Ethical Issues

Researchers and participants work together to do research, and it is always done fairly and with trust between the two groups. This investigation was conducted with ethical considerations in mind at every stage. The researcher strictly adhered to ethical guidelines to ensure that other people's work was never incorporated as her own and was properly acknowledged with citations.

Prior to the collection of data, participants were asked if they were willing to respond to questions. Each participant was informed about the identity of the study's researcher, the study's overall goal, methodology, and purpose. The rationale behind the study participants' selection was also provided. In order to protect them and their organization from any potential danger, it was made clear that their answers to the questions asked would only be used for academic research and would never be revealed to anybody.

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Introduction

This section presents the research findings together with a discussion of the data collected using survey questionnaires. The survey results indicate the degree of influence that risk variables and the risk management system have on construction projects. Additionally, survey surveys are used to categorize projects that come in over and under budget estimates.

4.2 Respondent profile

A questionnaire booklet consisting of 44 questions was distributed to 48 individual respondents selected from the project & Head office Senior operational & Project management leaders & Senior Engineering experts.

Table 4.1: Respondents Response Rate

Sector	Sample Size	No. of Respondents	Response rate(%)
Transport	16	16	100
Water	16	16	100
Building	16	14	87
Total	48	46	95.8

Source: Own Survey result (2024)

Respondents divided in to three groups, i.e. transport infrastructure construction, Water infrastructure and Building Construction sector. Table 4.1 shows 48 questionnaires distributed to respondents.

Out of 48 questionnaires distributed to the selected respondents 46 were filled properly and returned back. Therefore, this shows that the response rate (RR) was 95.8% which is more than suitable to proceed with. Accordingly, analysis and presentation was carried out as follows.

4.3 Personal Information of the Respondents

The first section of the questionnaire consists of six items about demographic characteristics of the respondents such as: gender group of respondents, academic qualification of respondents, work experience of the respondents in area & work experience of the respondents in company. The following table summarized the data pointed out from the respondents.

Table4.2 personal information of respondents

I/No	Description		Frequency	%
1	Gender of respondents	Male	40	87%
		Female	6	13%
		Total	**46**	**100%**
2	Age of Respondents	20-30	4	9%
		31 – 40	36	78%
		41 – 50	5	11%
		above 50 years	1	2%
		Total	**46**	**100%**
3	Academics qualification	Degree	28	61%
		Masters	18	39%
		Total	**46**	**100%**
4	Work Experience in area	1 - 5years	1	2%
		6 - 10 years	21	46%
		11 - 15 years	14	30%
		above 15 years	10	22%
		Total	**46**	**100%**
5	Work Experience in company	1 – 3 years	4	9%
		4 – 6 years	6	13%
		7– 10 years	17	37%
		above 10 years	19	41%
		Total	**46**	**100%**

Source: own survey results (2024)

From table 4.2 the genders of the respondents were seen to be 87 % (40) males while 13% (6) of them were females. The distribution indicates that men represent the majority of ECWC's senior construction professionals. It can be seen that about 8.7% (4) of the 46 respondents‟ age was between 20 -30 years;78.3% (36) of them were between the age of 31-40 years; 10.9% (5) of them at the age group of 41-50 years and 2.2 % (1) of the respondents were above 50 years of age. This shows that majority of the informants were within the age group of 31-40 years.

According to the analysis results for the educational level, we can see that, 60.9% (28) of the respondents were Degree holders, 39.1% (18) of them were postgraduates (master's degree holders) and from which it is seen that most of the respondents held an educational level of first degree which in turn indicates that the respondents had enough knowledge background to respond to the study subject area.

Work experiences of the respondents in the area (construction) were analyzed and observed to be distributed as 2.2 % (1) below five year, 45.7 % (21) between 6-10 years; 30.4% (14) between 11-15 years while 21.7 % (10)of them between above 15 years and 8.9%(4) years of experience in the area. This showed that majority of the respondents had between 6 to 10 years of work experience in the construction area which in turn points that they are quiet experienced to the industry deeply.

In addition to the related work experience in the construction area, respondents were requested to fill for how long they worked in their current respective company and resulted were analyzed as distributed in table 4.5. Accordingly, only 8.7% (4) worked below 3 year, 13 % (6) of them had between 4-6 years of experience, while 37 % (17) of them had worked for 7-10 years and 41.3 % (19) of are with the current company for more than 10 years. Here, it's clear that most of the respondents worked in their respective current companies / projects for 1-3 years and it shows that they had enough time to well know their respective company's trends and standards especially with regard to risk management practices.

4.3 Risk management process (Objective 1)

The respondents were also presented with questions targeted to know their general risk identification experience and know-how and their responses are summarized as follows.

Table 4.3. Respondent's response about potential risk identification

Q:-Do you agree that the project's potential risks were successfully identified?

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	6	13.0	13.0
	Disagree	12	26.1	26.1
	Neutral	3	6.5	6.5
	Agree	24	52.2	52.2
	Strongly agree	1	2.2	2.2
	Total	46	100.0	100.0

Source: own survey results (2024)

From table 4.3 above, we see that only 13 % (6) of the respondents strongly disagreed and 26.1 % (12) were disagree that potential risks successfully identified but 52.2 % (24) agreed while 2.2 % (1) of them strongly agreed that potential project risks successfully

identified 6.5% (3) of the respondent neutral about the issue.

Therefore, these presentations show that most of the respondents agreed that potential project risks identified successfully.

4.4. Respondent's response about in- depth risk analysis

Q: - Your projects carry out in-depth analyses of the possibility and impact of risks that have been identified.

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	3	6.5	6.5
	Disagree	22	47.8	47.8
	Neutral	7	15.2	15.2
	Agree	14	30.4	30.4
	Total	46	100.0	100.0

Source: own survey results (2024)

Another statement posed to the respondents was the existence of in-depth risk analysis in the Sector/project and was reacted by 6.5 % (3) strong disagreement and 47.8 % (22) disagreement while 15.2 % (7) of them were Neutral whether it existed or not. But, 30.4 % (14) of them agreed with statement as indicated in table 4.4 above. Hence, we can see that majority of the respondents disagreed that sectors/projects carry out in-depth analyses of the possibility and impact of risks that have been identified.

Table 4.5.Respondants response about risk monitoring & review

Q:-Your projects regularly monitor and review the effectiveness of its risk management processes.

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	9	19.6	19.6
	Disagree	22	47.8	47.8
	Neutral	6	13.0	13.0
	Agree	9	19.6	19.6
	Total	46	100.0	100.0

Source: own survey results (2024)

Table 4.5 above shows that the majority of respondents 67.4% (31) disagreed or strongly disagreed that project should regularly review and monitor the effectiveness of their risk

management method. While 13% (6) of them were uncertain about the issue but 19.6% (9) Respondents agreed that the sectors/projects regularly monitor and review the effectiveness of its risk management process.

Table 4.6. Respondent's response about risk management accountability & responsibility

Q:-Do you feel that there is clear accountability and responsibility assigned for risk management activities within your sector/projects?

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	5	10.9	10.9
	Disagree	17	37.0	37.0
	Neutral	12	26.1	26.1
	Agree	12	26.1	26.1
	Total	46	100.0	100.0

Source: own survey results (2024)

A requesting statement was made to know whether there is clear accountability and responsibility assigned for risk management activities with in the Sector/project responses were as in the above table 4.6.According which 10.9 % (5) strongly disagreed with that and 37 % (17) of them disagreed while 26.1 % (12) of them remained uncertain. But, 26.1 % (12) of them agreed.

From this, it can be seen that majority of the respondents disagreed there is no clear accountability and responsibility assigned for risk management activities within the sector /projects.

Table 4.7. Respondent's response about risk mitigation strategy

Q:-To what extent do you agree with the mitigation strategies implemented for risks identified in projects?

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	6	13.0	13.0
	Disagree	32	69.6	69.6
	Neutral	6	13.0	13.0
	Agree	2	4.3	4.3
	Total	46	100.0	100.0

Source: own survey result (2024)

Table 4.7 above clearly shows the tabulation of the reactions of the respondents to the statement that says to what extent do you agree with the mitigation strategies implemented for risks identified in projects?; in which 13 % (6) of them strongly disagreed and 69.6% (32) disagreed while 13 % (6) remained Neutral. But, 4.3 % (2) agreed that mitigation strategy implemented for the risk identified for the project

Based on these, it's shown that majority of the respondents disagreed that mitigation strategy implemented for the risk identified for the project.

Table 4.8. Respondent's response about risk related communication

Q:-The communication of risk-related information within the Sector/project is clear and effective.

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	8	17.4	17.4
	Disagree	27	58.7	58.7
	Neutral	2	4.3	4.3
	Agree	8	17.4	17.4
	Strongly agree	1	2.2	2.2
	Total	46	100.0	100.0

Source: own survey results (2024)

A requesting statement target at obtaining information whether the communication of risk-related information within the sector/project is clear an effective was made to the respondents and the reactions of the respondent were analyzed and summarized as in table 4.8 above from which one can read that, 17.4 % (8) of them strongly disagreed and 58.7% (27) of them disagreed while 4.3 % (2) of them were Neutral about the issue. But, 17.4 % (8) of them agreed and the remaining 2.2 % (1) of them strongly agreed that the communication of risk related information within the sector/project is clear and effective.

Thus, it can be seen that majority of the respondents disagreed that with statement the communication of risk related information within the sector/project is clear and effective.

Table 4.9.Respondant response about integration of risk management process

Q:-Risk management is integrated into the overall project planning process at the sector/project

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	1	2.2	2.2
	Disagree	35	76.1	76.1
	Neutral	10	21.7	21.7
	Total	46	100.0	100.0

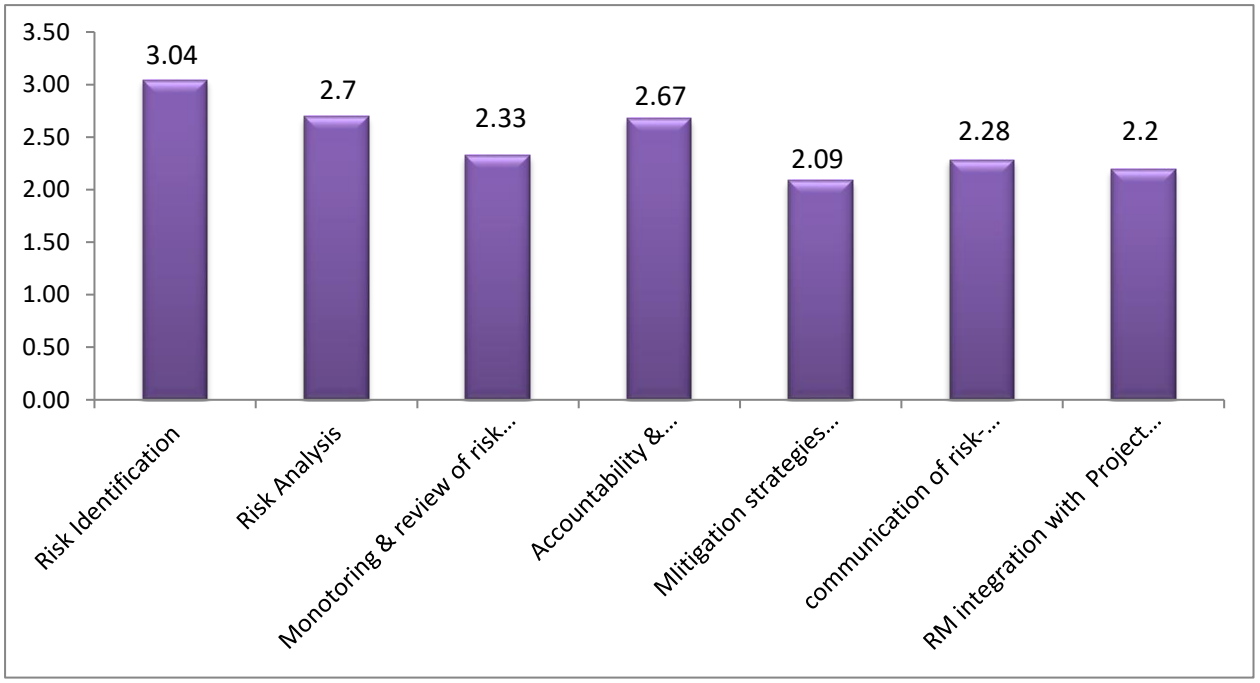
Source: own survey results (2024)

To see the efficiency of the risk planning activity another important question was raised as to comment whether Risk management is integrated into the overall project planning process at the sector /project and the respondents reacted in such a way as it can be seen in table 4.9 above where 2.2 % (1) strongly disagreed with that and 76.1 % (35) of them disagreed while 21.7 % (10) of them were remain Neutral.

From this, it can be seen that greater number of the respondents Disagree & no one agreed & strongly agreed that Risk management is integrated into the overall project planning process at the sector/project.

Summary of risk management process

The assessment of risk management process of Construction projects under ECWC which is the first objective of this research and the above discussions summarized as the following graph.(Fig 4.1)



As shown on the above figure Based on the mean values of the Likert scale questions provided for various aspects of risk management in ECWC, we can make the following observations:

1. Risk Identification (Mean = 3.04): This indicates that, on average, respondents perceive the company's performance in identifying risks to be relatively satisfactory.
2. Risk Analysis (Mean = 2.7): The lower mean score for risk analysis suggests that there may be room for improvement in the analysis of risks within the organization.
3. Monitoring & Review of Risk Management Process (Mean = 2.33) the low mean value in this area implies that the company may need to enhance its processes for monitoring and reviewing risk management practices.
4. Accountability & Responsibility about Risk Management (Mean = 2.67): The mean score for this aspect falls moderately, indicating that there is some perceived level of accountability and responsibility regarding risk management within the organization.
5. Mitigation Strategies Implemented for Risks Identified in Projects (Mean = 2.09): The relatively low mean value suggests that there might be a need to focus more on implementing effective mitigation strategies for identified risks in projects.
6. Communication of Risk-Related Information within the Project (Mean = 2.28): This mean value indicates that the communication of risk-related information within projects Under ECWC is lower
7. Risk Management Integration with Project Planning (Mean = 2.2): The lowest mean value among the items listed suggests that integrating risk management with project planning could be an area that requires attention and improvement within ECWC.

In summary, the results analyzed above indicate that the process of risk management under ECWC is in the beginning stage. It indicates that there is a certain amount of risk assessment in each project and there is also department that is responsible for risk management work. However, by strengthening the risk management strategy, he should work on risk analysis, monitoring processes, implementation of mitigation strategies, communication practices, and integration of risk management with project planning.

In addition this result in agreement with Seleshi (2018) “Project Risk Management Practices of Selected Chinese Building Contractors in Ethiopia”, Yimam (2011) “Project Management Maturity in The Construction Industry of Developing Countries (the Case of Ethiopian Contractors) and Getachew (2017) “Risk management practices on construction companies: focused on Yotek Construction, Flintstone Engineering, and Akir Construction” .

4.4 Implication of inadequate risk management on project cost (Objective 2)

Table 4.10.Respondants response about proactively addressing emerging risks Q: - During the project execution phase, your project proactively addresses emerging risks that could result in project cost overruns**.**

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	15	32.6	32.6
	Disagree	27	58.7	58.7
	Neutral	4	8.7	8.7
	Total	46	100.0	100.0

Source: own survey results (2024)

Table 4.10 depicts the reactions of the respondents to the statement "During the project execution phase, your project proactively addresses emerging risks that could result in project cost overruns." and it can be observed that 32.6 % (15) of them strongly disagreed with that and 58.7% (27) of them disagreed while 8.7 % (4) of them remained Neutral.

Here, it's clearly observed that majority of the respondents were Disagreed that emerging risks that could result in project cost overruns proactively address during project execution phase.

Table 4.11.Respondants response about satisfaction level of current risk management

Q:-Are you satisfied with the current risk management practices in mitigating project cost overruns?

		Frequency	Percent	Valid Percent
Valid	Strongly disagree	10	21.7	21.7
	Disagree	24	52.2	52.2
	Neutral	5	10.9	10.9
	Agree	7	15.2	15.2
	Total	46	100.0	100.0

Source: own survey results (2024)

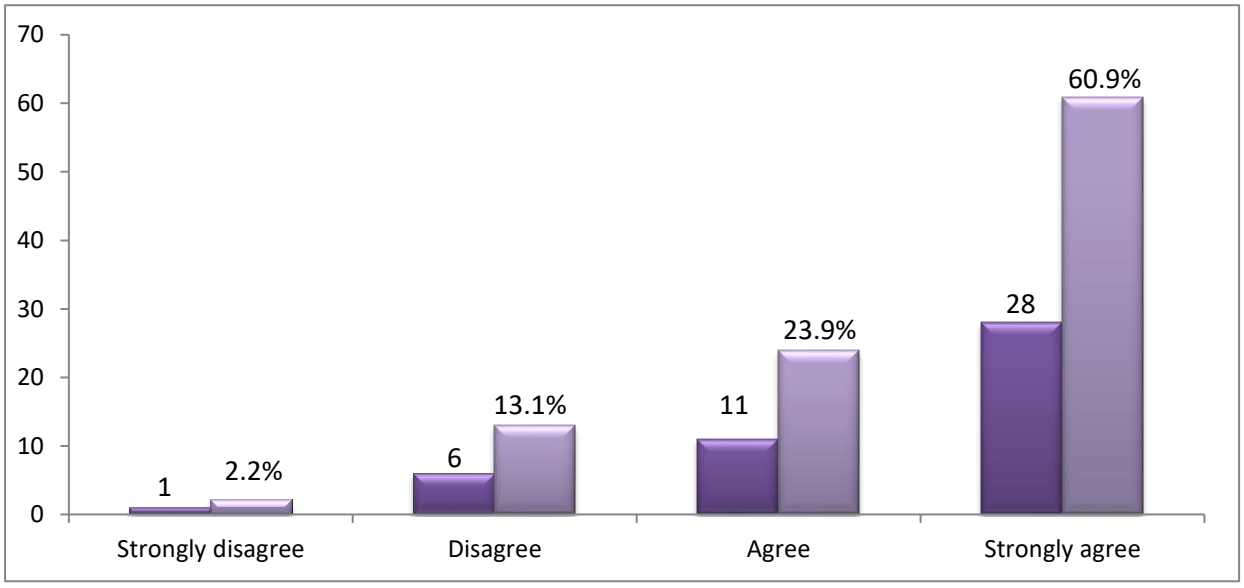
According to table 4.11 above which depicts the respondents responses distributions with regard to question are you satisfied with the current risk management practices in

mitigating project cost overruns? We can read that 21.7% (10) of them strongly disagreed, 52.2% (24) disagree and 10.9% (5) remained Neutral only 15.2% (7) of them agreed with the statement. From which we can observe that majority of the respondents disagreed with statement.

I. Do you agree inadequate risk management strategies lead to cost overruns in project implementation?

Responding appropriately to the Project risk management is a crucial aspect of project planning and execution. It involves identifying, assessing, and mitigating potential risks & that could impact the successful completion of a project. The process typically includes risk identification, risk analysis, risk response planning, and risk monitoring and control.

The respondents were also asked by the researcher if they agreed with the argument that insufficient risk management techniques result in project implementation cost overruns. The results of this analysis and presentation are shown below.



Source: own survey results (2024)

Figure 4.2 Respondents of Impact of inadequate risk management on Construction project cost

After doing all the risk management process responses, the next stage is to respond to the impact of inadequate risks management process on construction projects. The researcher once again depended for the reactions of the respondents as how most commonly responded to these issues. Their reactions were as in figure 4.2 above from which only

2.2 %(1) of them responded strongly disagree & 13.1% (6) of respondents disagree, while 23.9% (11) of them Agreed and 60.9% (28) respondents strongly agreed about the impact

of inadequate risk management process on construction cost .Therefore, it was seen that majority of the respondents confirmed that Inadequate risk management process have negative impact on the construction project costs.

Based on the responses gathered through the Likert scale question, it can be concluded that there is a notable level of concern among research participants regarding the adequacy of current risk management practices in mitigating project cost overruns. The majority of respondents either strongly disagreed or disagreed with the effectiveness of existing risk management strategies, highlighting a perceived need for improvement in this area to prevent or minimize cost overruns during project implementation.

In summary, the above result show inadequate risk management strategy has led to cost overrun for construction projects under ECWC. This result also agreed with a study by Flyvbjerg et al. (2003) found that poor risk management practices were a major contributor to cost overruns in transportation infrastructure projects. Similarly, Love et al. (2010) conducted a meta-analysis of construction project performance and identified risk management as a critical factor influencing project outcomes. Numerous elements that lead to insufficient risk management in building projects have been found by other study. Poor risk management methods can result from a number of causes, including a lack of experience, inadequate resources, and poor stakeholder communication, according to Zou et al. (2017). Furthermore, in order to reduce cost overruns, Liu et al. (2015) emphasized the importance of integrating risk management into the early stage of project planning.

4.5 Risk Factors Impact on construction project Cost (Objective 3)

After examining the company's risk management strategy & implication of inadequate risk management on project costs the next stage involved assessing the degree to which known risk factors influence the cost of constructing projects.

Since the corporation has identified 25 common risks into 5 groups, this study does not look at the occurrence of risk factors. However, by calculating the RII and impact level, the specific risk factors on the cost of construction projects under the corporation have been looked at as follows. The Relative Importance Indices (RII) ranks and impact level of the factors surveyed presented and discussed. The first five ranked risks are critical risk factors for projects under ECWC. Table 4.15 illustrates the overall insight of respondents Mean, RII, Rank and Impact Levels for each risk factor. Moreover, the combined and independent

observation by Transport infrastructure, Water infrastructure & Building & housing Construction Sector illustrated at appendix B

Table 4.12 Risk factors rated based on the impact level

I/No	Risk Factor	Mean	St. deviation	RII	Rank	Impact level
1	Cash flow and financial difficulties faced by projects	4.54	0.504	0.91	1	High
2	Fluctuations in the cost of material	4.50	0.587	0.90	2	High
3	High cost of machinery	4.50	0.506	0.90	2	High
4	Fluctuation in money exchange rate	4.50	0.548	0.89	3	High
5	Delay in payment to supplier /subcontractor	4.46	0.622	0.89	3	High
6	Inadequate pre-construction site study	4.33	0.732	0.87	4	High
7	Bad weather Condition	4.30	0.662	0.86	5	High
8	Poor coordination among the project participant	4.26	0.648	0.85	6	High
9	unavailability of material in local market	4.24	0.524	0.85	6	High
10	unexpected social conditions"	4.24	0.673	0.85	6	High
11	Lack of experience of technical Consultant	4.13	0.718	0.83	7	High
12	Changes in material specification and type "	3.91	0.784	0.78	8	high-medium
13	Inefficient Construction Methods "	3.83	0.797	0.77	9	high-medium
14	Change Order "	3.76	0.848	0.75	10	high-medium
15	Inadequate project preparation , planning & implementation"	3.74	0.612	0.75	10	high-medium

16	Insufficient numbers of equipment	3.63	0.572	0.73	11	high-medium
17	Modifying to standard drawings during Construction Stage	3.52	0.781	0.70	12	high-medium
18	Rework	3.52	0.836	0.70	12	high-medium
19	Design Change	4.15	0.759	0.55	13	medium
20	Number of projects going on at same time /work load	2.37	0.741	0.48	14	medium
21	Poor organizational Structure	2.26	0.801	0.45	15	medium
22	High cost of skilled labor	2.20	0.687	0.44	16	medium
23	Additional work order at client request	2.09	0.725	0.42	17	medium
24	Distance of site from Head quarter	1.96	0.729	0.39	18	medium-low
25	Poor performance of labor	1.91	0.784	0.38	19	medium-low
Note: low (0<RII<0.2), medium-low (0.2<RII<0.4), medium (0.4<RII <0.6), high-medium (0.6 <RII< 0.8), & high (0.8< RII<1)						

As indicated in Table 4.12 above, risk factors rated based on the impact level from the overall insight of respondents.

4.5.1 Risk of Design Group

This risk group contains 3 factors affecting cost overrun in overall ECWC Construction projects Design risk factor analysis "Lack of experience of technical Consultant" is the highest influential risk factor followed by "Modifying to standard drawings during Construction Stage" and "design change".

In transport infrastructure construction projects, it is shown that 2 out of 3 factors in this group are considered as highly impact factors of cost overrun in projects. In this group," Lack of experience of technical consultant "and "design change" is the most influencing factor of cost overrun followed by "Modifying to standard drawings during Construction Stage".

The order of design risk factors for water infrastructure projects are "design change" ,"lack of

experience technical consultant," and "modifying to standard drawings during construction stage" which have a medium-to-high influence on the project cost.
In the case of Building & Housing Construction Sector "Design change" & "Lack of experience of technical consultant" are the most influencing factors of projects cost overrun. In this group "modifying to standard drawings during Construction Stage" has medium-high level of cost impact in project cost.

4.5.2 Risk of Execution/Implementation

In construction projects, the risk of execution or implementation refers to the potential for unexpected events, circumstances, or factors that can hinder the successful completion of a project. In this study the group contains 3 factors affecting cost overruns in ECWC projects; it is show that all of 3 risk factors in this group are considered as medium-high impact factors of cost overrun in all ECWC projects in the hierarchy of "Changes in material specification and type ", "Inefficient Construction Methods", and "Rework".

In the case of transport infrastructure construction sector "Changes in material specification and type" is the most influencing risk factor for projects cost overrun followed by "Inefficient Construction methods" and "Rework" in high-medium level.

This risk group attributes a medium-high level of impact to cost overruns for projects under water infrastructure construction. The hierarchy of impact level is "Inefficient Construction Methods," "Changes in Material Specification and type," and "Rework."

The hierarchy of these group risk factors is the same for building and housing construction projects as it is for water infrastructure means High-medium level of impact for projects cost overrun, with the following impact levels: "Changes in material specification and type," "Inefficient Construction Methods," and "Rework."

4.5.3 Risk of Scope Group

Scope is a critical aspect of construction projects that can significantly impact project success. The risk factors related to scope in construction projects are essential to identify and manage effectively to ensure the project stays on track and meets its objectives.

This group contains 2 factors affecting cost overruns in ECWC projects; "Change order" is the most influencing risk factor with high-medium impact level followed by "Additional work order at client request" risks impact the project cost in medium level.

"Changes order" is the most significant risk factor in the transport infrastructure construction sector, with the highest level of project cost overruns. This is followed by "Additional work order at client request," which has a medium-low level of impact on construction projects.

In the case of water infrastructure construction sector "Changes order" is the most influencing risk factor in medium-high level for projects cost overrun followed by "Additional work order at client request" which is medium level of impact on construction projects.

"Changes order" is the most influencing risk factor in high-medium level to impact cost of projects under Building & Housing Construction Sector. In this group "Additional work order at client request" has medium-low level impact for projects cost overrun.

4.5.4 Risk of Site Group

Site conditions are a significant risk factor in construction projects, as they can significantly impact the project's schedule, budget, and safety. Unexpected site conditions can lead to delays, increased costs, and even project termination. Proper identification and management of potential site condition risks are crucial for successful project execution.

This group contains 2 factors affecting cost overruns in all ECWC projects; "Inadequate pre-construction site study" is the most influencing risk factor with high impact level and "Distance of site from Head quarter" risks impact the project cost in medium-low level.

In the case of transport infrastructure construction sector "Inadequate pre-construction site study" is the most influencing risk factor in the highest level for projects cost overrun followed by "Distance of site from Head quarter " which is medium-low level of impact on construction projects'.

"Inadequate pre-construction site study" is the most influencing risk factor in high level to impact cost of projects under Water infrastructure Construction Sector. In this group "Distance of site from Head quarter" has medium level impact for projects cost overrun.

The same goes for the two sectors mentioned above: "Inadequate pre-construction site study" has the greatest influence on project cost overruns at a high level, while "Site distance from head quarter" has a medium level of impact on building and housing construction projects.

4.5.5 Risk of Financial Group

This group includes three elements that effect ECWC project costs. It can be seen that all three of these factors are included in the first five critical risk factors that are thought to have a high impact on cost overruns for all ECWC projects. The top and critical risk factor for cost overrun in this group is "Cash flow & financial difficulties faced by contractor," which is followed by "Fluctuation in money exchange rate" and "Delay in payment to supplier / subcontractor."

The first, second, and fourth hierarchy risk groups in the case of the transportation infrastructure construction sector have a significant impact on the project's cost. "Cash flow & financial difficulties faced by contractor" is the risk factor with the highest level of influence, followed by "Fluctuation in money exchange rate" and "Delay in payment to supplier / subcontractor."

In the building and housing construction as well as water infrastructure sectors, this risk factor category has the most impact on project costs. The biggest risk factor is "Cash flow & financial difficulties faced by contractor," which is followed by "Delay in payment to supplier / subcontractor" and "Fluctuation in money exchange rate."

4.5.6 Risk of project Management Group

There are four factors in this group that influence cost overruns in all ECWC projects; the most significant risk factor with a high effect level is "poor coordination among the project participant." The following risks have a high-to-medium impact on project costs: "Inadequate project preparation, planning, and implementation"; "Number of projects going on at the same time / work load"; and "Poor organizational structure," which has a medium impact on project cost overruns. As a water and transport infrastructure construction sector respondents the risk factor hierarchy & impact level of in this group are the same on the above.

The first most significant risk factor in the building and housing construction sector with a high level of impact is "Inadequate project preparation, planning, and implementation," which is followed by "Poor coordination among the project participant" influence on project cost overrun. The tenth and eleventh rank risk factors, "number of projects going on at the same time / work load" and "poor organizational structure," have a medium impact level on the cost overrun of building and housing construction projects.

4.5.7 Risk of resource Group

This group includes 6 elements that effect ECWC project costs overrun. According to this research respondents "Fluctuations in the cost of material cost " and "High cost of machinery" the second ranked high level impact risks for ECWC construction projects cost overrun followed by" unavailability of material in local market" in 6th rank with the same impact level. "High cost of skilled labor" is the medium impact level risk factor for ECWC constructing projects; "insufficient numbers of equipment" is the high-medium impact level risk factor; and "poor labor performance" is the last and the medium-low impact level risk factors.

Three of the six risk factors in this group—"Fluctuations in the cost of material cost," "High cost of machinery," and "Unavailability of material in local market"—are the most influencing risk factors with a high impact level, according to a respondent from the transportation infrastructure construction sector. On the other hand, "Insufficient numbers of equipment" ranked in 10th place with a high-medium impact level, followed by "High cost of skilled labor" and "Poor performance of labor" with medium & medium low level of impact respectively.

"Fluctuations in the cost of material cost" and "High cost of machinery" are the top-ranked risk factors in the water infrastructure building sector. These are followed by "Unavailability of material in local market" with an equally high level of impact. For construction work under this sector, "High cost of skilled labor" and "Poor performance of labor" represent the medium impact level risk, while "Insufficient numbers of equipment" has a high-medium level influence on project costs.

In building & Housing construction sector "High cost of machinery", "Fluctuations in the cost of material cost" and “Unavailability of material in local market" are critical resource risk factors with high impact level which influence the project costs followed by “Insufficient numbers of equipment" with high-medium impact level. "High cost of skilled labor" medium level risk whereas "Poor performance of labor" is the last risk factor with medium-low impact level for he projects under this sector.

4.5.8 Risk of Environment Group

This group includes 2 elements that effect ECWC project costs overrun. “Bad weather Condition" is within critical risk factor followed by "unexpected social conditions” with high

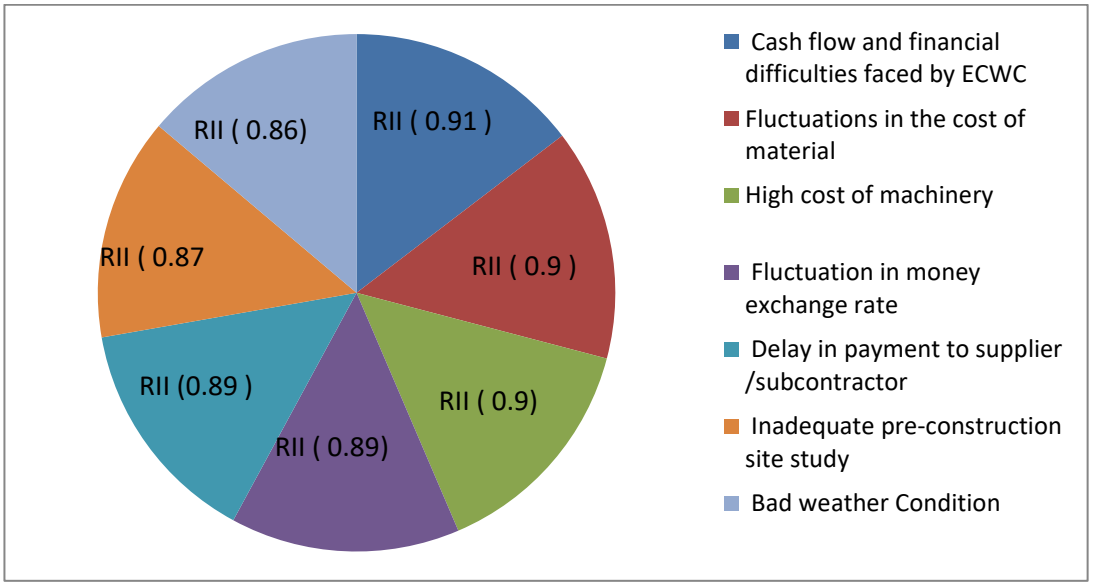
impact level to influence the project costs under ECWC. As per this research respondent these risk groups also have the greatest potential to affect project costs next to financial risk factors under the ECWC. "Unexpected social conditions" is the most significant risk factor followed by "Bad weather Condition" in the transport infrastructure construction sector, with the highest level of project cost overruns.

For projects under Water infrastructure construction sector this risk groups have critical impact on the project cost "Bad weather Condition" is the 3rd ranked risk factor followed by "unexpected social conditions" have 5th rank in this research.

As a water infrastructure construction sector also Building & Housing construction sector projects environment risk group have critical impact on project cost. The second-ranked risk factor in this study is "bad weather conditions," which is followed by "unexpected social conditions," which is ranked fourth.

Summary of Discussion

The foregoing discussion is summarized in the following graph, which was made based on the mean value of impact of risk factor for project cost overrun.



Source: own survey results (2024)

Figure 4.3 Critical risk factors on ECWC Construction project cost

According to the impact level of each risk element, the financial risk group is the most significant construction projects cost influencing risk factor, followed by environmental, design, execution, resource, management, site, and scope risk group with mean value of 4.5, 4.27, 3.9, 3.7, 3.5, 3.15, 3.14 and 2.9 respectively. In addition the above Figure 4.3 show that

the first 5 critical risk factors for the construction projects under ECWC are "Cash flow and financial difficulties faced by Contractors", "Fluctuations in the cost of material " , "High cost of machinery", "Fluctuation in money exchange rate", "Delay in payment to supplier /subcontractor", "Inadequate pre-construction site study", and "Bad weather Condition" ranked 1-5

"Cash flow and financial difficulties faced by projects" is the first critical risk factor with RII value 0.91 influencing the project cost overrun in ECWC according to this study (table 4.12). The result was also in agreement with the outcome of (Jarkas &Haupt, 2015) who studied on major construction risk factors considered by general-contractors in the State of Qatar. Research by Smith et al. (2017) highlighted that insufficient cash flow can result in delays in project completion, increased borrowing costs, and ultimately lead to cost overruns. Effective cash flow management strategies are essential to mitigate this risk factor.

The potential cause for the outcome could be One of the primary reasons for cash flow problems in construction projects in ECWC is delayed payments from clients or government entities. Delays in receiving payments for completed work can disrupt the cash flow of contractors and subcontractors, leading to financial strain. The other causes will be limited access to financing options and high interest rates on loans can hinder the financial stability of construction projects in ECWC. Many contractors struggle to secure adequate funding for their projects, which can result in cash flow issues.

Political unrest or economic instability in Ethiopia can also impact construction projects by causing delays, disruptions, or changes in government policies that affect project funding and implementation. Uncertainty in the business environment can lead to financial challenges for construction firms. In addition disputes over payment terms, contract variations, or quality issues between project stakeholders can lead to delays in payments and cash flow problems for construction companies. Resolving payment disputes can be time-consuming and costly, affecting the financial health of projects.

The second critical risk factors are "Fluctuations in the cost of material " & "High cost of machinery" with RII (0.9). This result is similar with Studies by Jones and Lee (2019) emphasized that unpredictable change in material prices can lead to budget deviations and cost overruns. Implementing proactive procurement strategies and establishing price escalation clauses in contracts are suggested as ways to address this risk. Garcia et al. (2018)

found that inadequate budgeting for machinery expenses and unexpected maintenance costs can strain project finances, leading to delays and increased expenditures. Proper equipment selection, maintenance planning, and budget allocation are crucial for managing this risk factor.

Fluctuations in the cost of materials can be happened by economic factors such as inflation, currency exchange rates, and global market conditions. If the Ethiopian Birr weakens against major currencies, the cost of importing materials can increase, impacting construction projects. Changes in the supply and demand dynamics of construction materials can lead to fluctuations in their prices. If there is a sudden increase in demand for specific materials driven by multiple projects at the same time, it can cause shortages and price hikes, affecting construction timelines and budgets in ECWC. Political instability or policy changes in Ethiopia can also affect the cost of materials used in construction projects. Uncertain political environments can create disruptions in the supply chain, leading to delays and increased costs as contractors may need to explore alternative sources for materials at higher prices.

Construction projects in ECWC may be challenged by high costs of machinery due to the expense of importing the equipment. Importing construction machinery can incur significant tariffs, taxes, and shipping costs, which contribute to the overall high cost that contractors have to bear. Fluctuations in currency exchange rates can also impact the cost of machinery for construction projects in ECWC. If the local currency depreciates against foreign currencies, the cost of importing machinery increases, making it more expensive for construction firms to acquire the necessary equipment. On other hand the limited local manufacturing capacity for construction machinery in Ethiopia can lead to high costs. When construction companies have to rely heavily on imported machinery due to a lack of local alternatives, they are likely to face higher prices due to importation expenses and the premium associated with specialized construction equipment brought into the country.

The third critical risk factor influencing construction project under ECWC are "Fluctuation in money exchange rate" and” Delay in payment to supplier /subcontractor" with RII (0.89).The result is in agreement with research by Akintoye et al. (2000) highlighted that currency exchange rate fluctuations can lead to increased material costs, affecting the overall project budget. The study emphasized the importance of hedging strategies and proactive risk management to mitigate the impact of exchange rate risks on construction projects. Furthermore, a study by Odeyinka et al. (2012) examined the effects of currency fluctuations

on construction projects in Nigeria. The research found that unpredictable changes in exchange rates could result in cost overruns, delays, and contractual disputes. The authors recommended incorporating flexible pricing mechanisms and financial instruments to manage currency risks effectively.

Fluctuations in money exchange rates can introduce financial uncertainty into construction projects in Ethiopia. When the exchange rate fluctuates, the cost of imported materials and equipment may increase unexpectedly, leading to budget overruns. This can disrupt project planning and cash flow management, making it difficult for project managers to accurately estimate costs and timelines.

Delayed payments to suppliers and subcontractors can strain relationships and lead to disruptions in the supply chain. When suppliers and subcontractors do not receive timely payments for their work or materials, they may slow down or stop work altogether, causing delays in the construction project. These delays can cascade throughout the project timeline, impacting milestones and deadlines.

The combination of fluctuating exchange rates and delayed payments can affect the overall viability of construction projects in Ethiopia. Unpredictable currency fluctuations and payment delays can increase the financial risks associated with the project. This can make it challenging for contractors and stakeholders to have confidence in the project's success, potentially leading to cost overrun or even project cancellations.

The fourth critical risk factor influencing construction project under ECWC is "inadequate pre-construction site study" with RII (0.87). Chen et al. (2020) highlighted that insufficient site investigation may result in design changes, rework, or encountering unexpected ground conditions, all of which can escalate project costs. Conducting thorough site surveys, soil testing, and feasibility studies before commencing construction are recommended strategies to address this risk.

Inadequate pre-construction site studies in ECWC projects can lead to a lack of comprehensive understanding of the site conditions. This can include insufficient knowledge about soil composition, drainage patterns, geological features, and environmental factors. Without a detailed understanding of these aspects, construction projects may encounter unforeseen challenges and risks during the construction phase, leading to delays, cost overruns, and potential safety hazards.

Inadequate pre-construction site studies can also result in mismanagement of resources. Without accurate information about the site, project planners may allocate resources inappropriately or underestimate the materials needed for construction. This can lead to inefficiencies, budget overruns, and delays as construction teams may have to adjust their plans mid-project to accommodate the new information obtained during construction.

Insufficient pre-construction site studies can increase the risk of structural failures in buildings and infrastructure projects. Without a thorough assessment of the site conditions, engineers may design structures that are not well-suited to the environment, leading to weaknesses and vulnerabilities that could compromise the integrity and safety of the construction. This can pose serious risks to the occupants and users of the completed project, as well as incur additional costs for remediation and repairs.

The fifth critical risk factor influencing construction project under ECWC is "Bad weather Condition" With RII (0.86). This result is in agreement with research by Loosemore et al. (2006) investigated the impact of adverse weather on construction project performance. The study identified bad weather as a critical risk factor contributing to schedule delays and cost overruns. A study by Assaf and Al-Hejji (2006) explored the effects of weather-related risks on construction projects in Kuwait. The research highlighted that extreme weather events could lead to productivity losses, resource wastage, and rework, ultimately impacting project costs. The authors recommended implementing contingency plans and monitoring weather forecasts to minimize the adverse effects of bad weather on construction projects.

One possible reason for the result could be our country Ethiopia experiences a unique weather pattern characterized by distinct wet and dry seasons. The rainy season typically occurs from June to September, with heavy rainfall leading to waterlogging and delays in construction activities. This prolonged wet period can significantly impact the progress of building projects, causing delays and cost overruns due to the inability to work efficiently during these months. For the past 3-2 years Addis Ababa is susceptible to sudden weather changes, including unexpected heavy rains, storms, and hailstorms. These unpredictable weather events can damage construction materials, equipment, and structures, leading to additional costs for repairs and reworks. Moreover, such weather disruptions can halt construction activities abruptly, causing delays that result in increased project expenses. In other way most of the water & transport infrastructure construction projects are undertaken far from main city in topography of hilly terrains prone to soil erosion and landslides during the rainy season. Construction sites

located in these areas face challenges related to soil stability and erosion control. Heavy rainfall exacerbates these issues, leading to soil instability, slope failures, and disruptions in construction work. Mitigating these risks requires additional measures such as proper drainage systems and reinforcement techniques, adding extra costs to the project budget.

In addition apart from heavy rainfall, Ethiopia also experiences temperature extremes in some places. This High temperature during the dry season can affect construction workers' productivity and safety on-site. Extreme heat may necessitate adjustments in work schedules or the provision of cooling facilities, which can increase operational costs for construction projects. Additionally, temperature fluctuations can impact productivity of construction equipment, curing process of concrete and other materials, potentially compromising the quality of construction work and leading to rework expenses.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

In this section the main findings of the research is summarized and conclusions on major findings is presented. Recommendations are given based on the research findings and the limitation of the Study is mentioned. Finally, the study forwarded some suggestions for further investigations.

5.1 Summary of Findings

The purpose of the underlying research is to assess risk management process to control construction project cost overrun under ECWC. This study used a combination of qualitative and quantitative research analysis methods to achieve its goals. Descriptive research design was also used in the study to describe the facts and circumstances related to the research topics. To answer the research questions, the research findings are summarized as follows.

I. What is the existing risk management procedures implemented in construction projects by the ECWC?

The process of risk management under ECWC is in the beginning stage. It indicates that there is a certain amount of risk assessment in each project and there is also department that is responsible for risk management work. However, by strengthening the risk management strategy, ECWC should work on risk analysis, monitoring processes, implementation of mitigation strategies, communication practices, and integration of risk management with project planning.

Furthermore, this leads to agreement with Yimam (2011)'s "Project Management Maturity in The Construction Industry of Developing Countries (the Case of Ethiopian Contractors)," Getachew (2017) "Risk management practices on construction companies: focused on Yotek Construction, Flintstone Engineering, and Akir Construction," and Seleshi (2018) "Project Risk Management Practices of Selected Chinese Building Contractors in Ethiopia."

II. What are the specific effects of inadequate risk management on the costs of ECWC's construction projects?

Based on the responses gathered through the Likert scale question, it is a notable finding of concern among research participants regarding the adequacy of current risk management practices in mitigating project cost overruns. The majority of respondents either strongly disagreed or disagreed with the effectiveness of existing risk management strategies, highlighting a perceived need for improvement in this area to prevent or minimize cost overruns during project implementation.

In this regard, the results above demonstrate that poor risk management practices have caused construction projects covered by the ECWC to go over cost. This outcome also supported a 2003 study by Flyvbjerg et al. that discovered inadequate risk management procedures were a significant cause of cost overruns in transportation-related projects. Similarly, Love et al. (2010) found that risk management is a crucial component impacting project results in their meta-analysis of construction project performance. Numerous factors have been identified by various studies as contributing to inadequate risk management in construction projects. According to Zou et al. (2017), insufficient resources, a lack of experience, and poor stakeholder communication are some of the factors that might lead to poor methods of risk management. Furthermore, Liu et al. (2015) emphasized the significance of including risk management into the early stages of project planning in order to decrease cost overruns.

III. What critical risk factors contribute to cost overruns in ECWC's construction projects?

The financial risk group is the most important risk factor that influences the cost of construction projects, as determined by the impact level of each risk element. Other risk groups that influence costs include the environmental, design, execution, resource, management, site, and scope risk groups, with mean values of 4.5, 4.27, 3.9, 3.5, 3.15, 3.14, and 2.9, respectively. Furthermore, as shown in Figure 4.3, the top five critical risk factors for construction projects covered by the ECWC are: "Delay in payment to supplier/subcontractor; inadequate pre-construction site study; cash flow and financial difficulties faced by contractors; fluctuations in the cost of material; high cost of machinery; fluctuations in the money exchange rate."

5.2 Conclusions:

First of all the research findings indicate that the risk management process under ECWC is in its initial stages, with some level of risk assessment being conducted in each project and a dedicated department responsible for risk management. However, there is room for improvement by enhancing the risk management strategy. This improvement should focus on areas such as conducting thorough risk analysis, establishing robust monitoring processes, and implementing effective mitigation strategies, enhancing communication practices regarding risks, and integrating risk management seamlessly with project planning. By addressing these key aspects, ECWC can enhance its overall risk management framework and better safeguard its projects against potential risks and uncertainties.

The second research findings clearly indicate a significant gap in the perceived effectiveness of current risk management practices in mitigating project cost overruns. The most number of participants expressing dissatisfaction with the existing strategies underscores the urgent need for improvement in this crucial aspect of project management. It is evident that a more robust and proactive approach to risk management is essential to address the concerns raised by respondents and enhance the overall success rate of projects by minimizing cost overruns.

The top five critical risk factors identified for construction projects under ECWC are delay in payment to supplier/subcontractor, inadequate pre-construction site study, cash flow and financial difficulties faced by contractors, fluctuations in the cost of material, high cost of machinery, and fluctuations in the money exchange rate. These risk factors can significantly impact project timelines, budgets, and overall success. It is crucial for ECWC to address these risks proactively to mitigate their negative effects on project outcomes.

5.3 Recommendation

To strengthen the risk management practices within ECWC, it is recommended that the organization prioritize the development of a comprehensive risk analysis framework that identifies and assesses potential risks across all projects. Additionally, implementing proactive monitoring processes to track and evaluate risks throughout the project lifecycle will enable timely interventions and adjustments. Furthermore, the adoption of effective mitigation strategies tailored to specific risks, coupled with clear communication practices to ensure stakeholders are informed about potential risks and mitigation efforts will enhance

overall risk preparedness. Lastly, integrating risk management considerations into project planning from the outset will foster a more proactive approach to risk mitigation and improve project outcomes in the long run.

In light of the research findings, it is recommended that ECWC prioritize the enhancement of their risk management practices to better address and mitigate project cost overruns. This can be achieved through investing in comprehensive risk assessment tools, providing specialized training for project teams on risk identification and mitigation strategies, and fostering a culture that values proactive risk management. Additionally, regular reviews and updates of risk management processes should be conducted to ensure alignment with evolving project requirements and industry best practices. By implementing these recommendations, ECWC can significantly improve their ability to anticipate and manage risks effectively, thereby reducing the likelihood of costly project overruns.

Finally to effectively manage these critical risk factors, ECWC should implement robust payment management systems to ensure timely payments to suppliers and subcontractors. Conducting thorough pre-construction site studies can help identify potential challenges early on and allow for proper planning. ECWC should also focus on improving their cash flow management practices and financial stability to navigate through uncertainties. Monitoring and hedging against fluctuations in material costs and currency exchange rates are essential strategies to minimize financial risks. Additionally, investing in efficient machinery and exploring cost-effective alternatives can help reduce expenses and enhance project profitability.

5.4 Limitation and Further Studies area

- **Limitations of the Study:**

The research on the assessment of risk management processes to control construction project costs under ECWC may have some limitations that could impact the generalizability and applicability of the findings. Some potential limitations include:

1. **Sample Size:** The study have a limited sample size, focusing only on a specific set of construction projects under ECWC. This could restrict the broader applicability of the results to other companies or industries.

2. **Scope of Risk Factors:** The study has not covered all possible risk factors that contribute to cost overruns in construction projects. Future researches may have included additional variables that have not addressed in this research.

- **Future Studies Areas:**

Based on the findings and limitations of this study, several areas warrant further investigation for future research:

1. Future research could investigate how poor risk management affects other aspects of construction project performance, such as schedule overruns, reputation, and quality.
2. Conducting a comparative analysis between different companies or industries to evaluate how risk management processes vary and their impact on construction project costs could provide valuable insights for practitioners and researchers.
3. Long-term studies tracking the effectiveness of risk management strategies over multiple projects within ECWC could offer a more comprehensive understanding of how these processes influence cost outcomes over time.

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APPENDICES

APPENDIX A

Dear Sir/Madam;

This research is being conducted as partial fulfillment of Master's Degree in Project Management with the title: **"Risk Management Practice and its impact on cost in ECWC's Construction projects."**

The goal of this questionnaire is to collect data from a selected group of departments in order to to evaluate and analyze the existing risk management practices employed by ECWC in their construction projects in order to identify areas of improvement and develop strategies that effectively mitigate cost overruns. The data collected will be compared with the findings of previous research to highlight any discrepancies that may be causing projects to go over budget.

The results of this survey will be kept confidential and used for academic purpose only. Respondent's name and organization's name will be kept anonymous. However, the outcome of the research can be made available to you if you desire so. The respondents' participation is voluntary.

Your participation is highly valuable for the outcome of this research. I appreciate your positive consideration in responding to this questionnaire and assisting me in my researchefforts. If you have any questions please call on +251935404601 or email at tsehayd939@gmail.com

Thank you for your Cooperation!

General instruction and information

Greetings, participant This questionnaire booklet is divided into three sections: part I asks questions about the respondent's general information; part II and part III are made up of closed-ended questions to survey ECWC projects risk management practice & risk factors which influence Construction project cost.

Part I: General Information of respondent: tick √ on the respective boxes

1. Age: 20-30 □ 31 – 40 □ 41 – 50 □ above 50 years □
2. Sex: Male □ Female □
3. Level of education: Diploma □ Degree □ Masters □ PhD□
4. Years of working experience in the area:

   Below 1 □ 1 – 5 □ 6 – 10 □ 11 – 15 □ above 15 □
5. Years of working experience in this company/project:

   Below 1 □ 1 – 3 □ 4 – 6 □ 7– 10 □ above 10 □
6. Department of work

   □ Transport Infrastructure Construction Sector

   □ Water infrastructure Construction Sector

   □ Building & Housing Construction Sector

Part II: Questions on risk management practices in ECWC Sectors/projects

Indicate your opinion by marking (√ or X) to the appropriate box corresponding to the number against the respective questions on the following five point scale questions that best describes your perception.

I/No	Description	Strongly disagree (1)	disagree (2)	Neutral (3)	agree (4)	Strongly agree (5)
1	Do you agree that the project's potential risks were successfully identified?					
2	Your projects carry out in-depth analyses of the possibility and impact of risks that have been identified.					
3	Your projects regularly monitor and review the effectiveness of its risk management processes.					
4	Do you feel that there is clear accountability and responsibility assigned for risk management activities within your sector/projects					
5	To what extent do you agree with the mitigation strategies implemented for risks identified in projects?					
6	The communication of risk-related information within the Sector/project is clear and effective.					
7	Risk management is integrated into the overall project planning process at the sector/project					
8	During the project execution phase, your project proactively addresses emerging risks that could result in project cost overruns.					
9	are you satisfied with the current risk management practices in mitigating project cost overruns?					
10	Do you agree inadequate risk management strategies lead to cost overruns in project implementation?					

Part III Risk factors which have impact on the project cost.

This Part is about Risk factors which have impact on the project cost. Indicate your opinion by marking (√ or X) to the appropriate box corresponding to the number against the respective questions on the following five point scale questions that best describes your perception.

I/No	Description	Impact				
		Insignificant (1)	Low (2)	Medium (3)	High (4)	V. High (5)
1	**Design**					
1.1	Design changes					
1.2	Modifying to standard drawings during Construction Stage					
1.3	Lack of experience of technical Consultant					
2	**Execution/implementation**					
2.1	Inefficient Construction Methods					
2.2	Changes in material specification and type					
2.3	rework					
3	**Scope**					
3.1	Change order					
3.2	Additional work order at client request					
4	**Site**					
4.1	Inadequate pre-construction of site study					
4.2	Distance of site from HQ					
5	**Financial**					
5.1	Cash flow and financial difficulties faced by Contractors					
5.2	Fluctuation in money exchange rate					
5.3	Delay in payment to supplier /subcontractor					
6	**Management**					
6.1	Inadequate project preparation , planning & implementation					
6.2	Poor organizational Structure					

6.3	Number of projects going on at same time /work load					
6.4	Poor coordination among the project participant					
7	**Resource**					
7.1	Fluctuations in the cost of material cost					
7.2	unavailability of material in local market					
7.3	High cost of machineries					
7.4	Insufficient numbers of equipment					
7.5	High cost of skilled labor					
7.6	Poor performance of labor					
8	**Environment**					
8.1	unexpected social conditions					
8.2	Bad weather Condition					

APPENDIX B

Transport Infrastructure Construction Sector							
Risk factors rated based on the impact level							
I/No	Risk Factors	N	Mean	Std. Deviation	RII	Ranks	Impact level
1	Cash flow and financial difficulties faced by Contractors	16	4.69	.479	0.94	1	High
2	Fluctuation in money exchange rate	16	4.69	.479	0.94	1	High
3	Fluctuations in the cost of material	16	4.56	.629	0.91	2	High
4	Delay in payment to supplier /subcontractor	16	4.50	.516	0.90	3	High
5	Inadequate pre-construction site study	16	4.44	.727	0.89	4	High
6	High cost of machinery	16	4.44	.512	0.89	4	High
7	Poor coordination among the project participant	16	4.31	.602	0.86	5	High
8	Lack of experience of technical Consultant	16	4.19	.655	0.84	6	High
9	Changes in material specification and type	16	4.19	.403	0.84	6	High
10	Design Change	16	4.125	.8851	0.83	7	High
11	Change Order	16	4.13	.806	0.83	7	High
12	Unavailability of material in local market	16	4.13	.500	0.83	7	High
13	Unexpected social conditions	16	4.13	.619	0.83	7	High
14	Bad weather Condition	16	4.06	.574	0.81	8	High
15	Inefficient Construction Methods	16	3.75	.775	0.75	9	High-Medium

16	Inadequate project preparation , planning & implementation	16	3.75	.447	0.75	9	High-Medium
17	Insufficient numbers of equipment	16	3.69	.602	0.74	10	High-Medium
18	Modifying to standard drawings during Construction Stage	16	3.63	.806	0.73	11	High-Medium
19	Rework	16	3.56	.727	0.71	12	High-Medium
20	Number of projects going on at same time /work load	16	2.38	.719	0.48	13	Medium
21	Poor organizational Structure	16	2.19	.834	0.44	14	Medium
22	High cost of skilled labor	16	2.13	.619	0.43	15	Medium
23	Distance of site from Head quarter	16	2.00	.632	0.40	16	Medium-Low
24	Poor performance of labor	16	2.00	.730	0.40	16	Medium-Low
25	Additional work order at client request	16	1.81	.544	0.36	17	Medium-Low
	Valid N (list wise)	16					

Note: low (0<RII<0.2), medium-low (0.2<RII<0.4), medium (0.4<RII <0.6), high-medium (0.6 <RII< 0.8), & high (0.8< RII<1)

Water Infrastructure Construction Sector							
Risk factors rated based on the impact level							
I/No	Risk Factors	N	Mean	Std. Deviation	RII	Rank	Impact level
1	Fluctuations in the cost of material cost	16	4.63	.500	0.93	1	High
2	High cost of machinery	16	4.63	.500	0.93	1	High
3	Cash flow and financial difficulties faced by Contractors	16	4.50	.516	0.90	2	High
4	Delay in payment to supplier /subcontractor	16	4.50	.632	0.90	2	High
5	Fluctuation in money exchange rate	16	4.44	.629	0.89	3	High
6	Bad weather Condition	16	4.44	.727	0.89	3	High
7	Unavailability of material in local market	16	4.38	.500	0.88	4	High
8	Inadequate pre-construction site study	16	4.31	.704	0.86	5	High
9	Unexpected social conditions	16	4.31	.704	0.86	5	High
10	Poor coordination among the project participant	16	4.19	.655	0.84	6	High
11	Design Change	16	4.000	.8165	0.80	7	High-Medium
12	Lack of experience of technical Consultant	16	4.00	.966	0.80	7	High-Medium
13	Inefficient Construction Methods	16	3.81	.981	0.76	8	High-Medium
14	Changes in material specification and type	16	3.81	.911	0.76	8	High-Medium
15	Insufficient numbers of equipment	16	3.69	.479	0.74	9	High-Medium
16	Inadequate project preparation , planning & implementation	16	3.63	.885	0.73	10	High-Medium
17	Change Order	16	3.56	.892	0.71	11	High-Medium

18	Rework	16	3.50	.966	0.70	12	High-Medium
19	Modifying to standard drawings during Construction Stage	16	3.38	.806	0.68	13	High-Medium
20	Additional work order at client request	16	2.44	.814	0.49	14	Medium
21	Number of projects going on at same time /work load	16	2.19	.834	0.44	15	Medium
22	Poor organizational Structure	16	2.13	.619	0.43	16	Medium
23	High cost of skilled labor	16	2.13	.719	0.43	16	Medium
24	Poor performance of labor	16	1.75	.856	0.35	17	Medium
25	Distance of site from Head quarter	16	1.69	.793	0.34	18	Medium
	Valid N (list wise)	16					

Note: low (0<RII<0.2), medium-low (0.2<RII<0.4), medium (0.4<RII <0.6), high-medium (0.6 <RII< 0.8), & high (0.8< RII<1)

Building & Housing Construction Sector							
Risk factors rated based on the impact level							
Code	Risk Factors	N	Mean	Std. Deviation	RII	Rank	Impact level
1	Inadequate project preparation , planning & implementation	14	3.86	.363	0.94	1	High
2	Cash flow and financial difficulties faced by Contractors "	14	4.43	.514	0.89	2	High
3	High cost of machinery	14	4.43	.514	0.89	2	High
4	Bad weather Condition	14	4.43	.646	0.89	2	High
5	Design Change	14	4.357	.4972	0.87	3	High
6	Fluctuation in money exchange rate	14	4.36	.497	0.87	3	High
7	Delay in payment to supplier /subcontractor	14	4.36	.745	0.87	3	High
8	Poor coordination among the project participant	14	4.29	.726	0.86	4	High
9	Fluctuations in the cost of material	14	4.29	.611	0.86	4	High
10	unexpected social conditions	14	4.29	.726	0.86	4	High
11	Lack of experience of technical Consultant	14	4.21	.426	0.84	5	High
12	Inadequate pre-construction site study	14	4.21	.802	0.84	5	High
13	Unavailability of material in local market	14	4.21	.579	0.84	5	High
14	Inefficient Construction Methods	14	3.93	.616	0.79	6	High-Medium
15	Changes in material specification and type	14	3.71	.914	0.74	7	High-Medium
16	Modifying to standard drawings during Construction Stage	14	3.57	.756	0.71	8	High-Medium
17	Change Order	14	3.57	.756	0.71	8	High-Medium

18	Rework	14	3.50	.855	0.70	9	High-Medium
19	Insufficient numbers of equipment	14	3.50	.650	0.70	9	High-Medium
20	Number of projects going on at same time /work load	14	2.57	.646	0.53	10	Medium
21	Poor organizational Structure	14	2.50	.941	0.50	11	Medium
22	High cost of skilled labor	14	2.36	.745	0.49	12	Medium
23	Distance of site from Head quarter	14	2.21	.699	0.44	13	Medium
24	Additional work order at client request	14	2.00	.679	0.40	14	Medium-Low
25	Poor performance of labor	14	2.00	.784	0.40	14	Medium-Low
	Valid N (list wise)	14					
Note: low (0<RII<0.2), medium-low (0.2<RII<0.4), medium (0.4<RII <0.6), high-medium (0.6 <RII< 0.8), & high (0.8< RII<1)							