PROJECT RISK MANAGEMENT PRACTICES AND CHALLENGES: THE CASE OF JIMMA ZONE ROAD CONSTRUCTION PROJECTS

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Abstract

This study examined the practices and challenges of project risk management in road construction projects within Jimma Town. Its primary objectives were to evaluate the key challenges in managing risks, determine the likelihood of various risk factors occurring, and analyze their effects on project cost, time, and overall objectives, as well as the response strategies adopted to address them. To achieve this, a structured questionnaire covering 47 potential risk factors was administered to a statistically representative group of contractors and consultants. The results indicated that risk avoidance, transfer, mitigation, acceptance, and sharing were the most commonly applied strategies for addressing high-impact risks. The research further identified three major obstacles to effective risk management: the absence of clear policies and procedures, inadequate risk modeling tools, and limited practical experience. Based on these findings, the study emphasized that risk identification is the most critical step in project risk management and must be approached systematically. Effective identification and assessment of risks, combined with process improvements and efficient resource utilization, were found to be central benefits of adopting structured risk management practices. Moreover, the study reinforced that risk analysis and management remain vital elements in road construction project management, enabling organizations to deal with uncertainty and unforeseen circumstances while enhancing the chances of project success. It recommended that construction firms provide regular training for technical staff to stay updated on emerging technologies, thereby strengthening workforce capabilities and reducing costs, time, and effort. Additionally, the adoption of well-documented procedures for risk identification and management, supported by strong policies and accurate assessment methods, can significantly improve risk reduction and control throughout the project life cycle.

Keywords Construction project, Risk, Risk identification, Risk analysis, and Risk response

INTRODUCTION

The construction industry is one of the most significant sectors driving the economic growth of any nation. As noted by Flanagan (2006), construction projects are characterized by their non-repetitive nature, unique specifications, lengthy durations, complex procedures, challenging environments, financial constraints, and dynamic organizational structures. Within this sector, road construction stands out as a vital component, as it not only addresses rapidly evolving societal needs but also contributes directly to improving the economic and social well-being of communities.

Risk in this context is understood as an event associated with uncertainty, typically measured by its likelihood of occurrence. Risk management, therefore, involves the systematic process of identifying, assessing, and responding to risks. According to Potts (2008), this process should be integrated into the project team from the earliest stages to ensure risks are recognized and addressed promptly.

Construction projects, by their very nature, are exposed to diverse and complex risks (Deng, 2013; Zhao, 2013). Road construction, in particular, involves multiple stakeholders—including owners, designers, consultants, contractors, subcontractors, and suppliers—making it especially vulnerable to risk factors. Previous research underscores the value of applying risk management practices. Simister (1994) highlighted that such practices enable the preparation of more realistic project plans, better identification and understanding of risk factors, appropriate contingency assessments, improved decision-making, and allocation of risks to the parties most capable of handling them. Similarly, Mok (1997) emphasized that risk management strengthens the decision-making process by encouraging more realistic approaches to potential threats. Ali (2000) further demonstrated that adopting risk management not only aids in delivering projects on schedule and within budget but also enhances awareness of possible outcomes and enables the development of alternative scenarios.

The Association for Project Management (APM, 2006) notes that projects are inherently risky due to their uniqueness, complexity, assumptions, and human involvement. For this reason, risk management should be embedded throughout the project life cycle. Godfrey (1996) argued that risk management must concern all stakeholders, as construction projects inherently carry risk factors with potentially severe consequences. Kangari and Riggs (1989) also stressed that, given the significant time and capital investment in construction projects, effective knowledge and application of risk management are essential for achieving objectives within defined cost, time, and quality constraints. However, project delays, cost overruns, and compromised quality remain common and widespread issues in the global construction industry (Mahamid, 2014).

Considering the extensive exposure of the construction sector to various risks, it is imperative that all stakeholders adopt appropriate risk management practices to safeguard project efficiency. According to the Project Management Institute (PMI, 2004), the key purpose of risk identification is to generate a comprehensive list of potential risks to be managed. Tchankova (2012) further explained that proper risk identification transforms uncertain threats into manageable occurrences, thereby enabling effective risk control and minimizing unforeseen consequences.

Statement of the Problem

Due to the complex and interconnected nature of construction activities, the success of project implementation largely depends on the level of risks involved (Paslawski, 2013). Road construction projects, in particular, are highly exposed to risks that can either hinder or facilitate the achievement of project objectives. Throughout the project life cycle, significant uncertainty exists, which may manifest as both known and unknown risks. According to the Ethiopian Roads Authority (ERA) midterm review (2005), the participation of local contractors and consultants in donor-financed road projects has been limited. Those who do participate often face challenges such as inadequate financial capacity, limited experience, unprepared site conditions, and poor resource management—issues that persist from project initiation through completion. Moreover, risks may emerge at any stage of the project life cycle and originate from different stakeholders, including project members and external actors.

As noted by the Project Management Institute (PMI, 2004), road construction projects inherently involve greater risks due to the engagement of multiple parties such as owners, designers, contractors, subcontractors, and suppliers. These risks significantly affect project outcomes in terms of cost, time, and quality. The road construction industry, therefore, is strongly associated with a high degree of risk, given the influence of micro-, meso-, and macro-environmental factors (Zavadskas, 2010). In fact, Shevchenko et al. (2008) observed that the sector has developed a poor reputation for risk management, as many projects fail to meet deadlines and cost targets.

Although construction risk factors may appear similar across projects, variations in socioeconomic conditions, environmental factors, cultural settings, and situational contexts contribute to unpredictable risks. As Zhi (1995) pointed out, even projects of similar nature may exhibit entirely different risk characteristics depending on the region. In the Jimma Zone, the rapid economic growth has created an urgent demand for infrastructure development, particularly road networks. While this offers opportunities for stakeholders, the effective use of risk management techniques to identify and plan responses to key risk factors remains a pressing challenge. Most recent studies have concentrated on general risk management practices, rather than specifically identifying the critical risks in road construction projects. Furthermore, there is limited research on risk identification in developing countries (Hameed, 2007).

Risk identification is a fundamental step in the risk management process. Thorough identification and assessment of key risk factors enable project teams to either eliminate risks or design effective mitigation strategies. Moreover, comprehensive risk identification fosters a better understanding among stakeholders, strengthens collaboration, and leads to more informed project decisions. Effective identification in the early stages of a project not only minimizes threats but also allows managers to capitalize on potential opportunities. Conversely, neglecting this step essentially implies an acceptance of risks, should they arise later in the project.

In the context of road construction, it is crucial to identify the most significant risks during the pre-construction phase to improve efficiency and project success. The additional motivation for this research also stems from direct observation of the poor performance of road projects in Jimma Zone. Many ongoing projects are lagging behind expectations, negatively impacting the daily lives of city residents.

Therefore, this study focuses on examining the current challenges of risk management in road construction projects in the Jimma Zone. The primary objective is to identify the major risk factors likely to affect project performance throughout the project life cycle. Additionally, the research investigates the challenges in implementing risk management practices and proposes suitable response strategies for risks with a high likelihood of influencing road project outcomes. To achieve this, critical risk factors will be identified through a literature review, while their probability of occurrence, risk ratings, and corresponding responses will be assessed using data collected from project management professionals, including Grade One contractors and consultants.

Research Questions

What are the challenges of the existing project risk management practices in Jimma Zone road construction projects?

What are the critical project risks factors influencing the Road construction project?

Which project risk factors have the highest probability of occurring?

Which project risk factors have the highest impact on project time and cost objectives?

Research Objectives

The general objective of this study is to examine how risks in road construction projects can be managed effectively through the application of the risk management process, which includes risk identification, risk analysis, and risk response strategies.

Specific Research Objectives

To identify major risks factors, their risk rating and probability of occurrences for road construction and response plan projects via questioner.

To discuss the challenges of the existing project risk management implementation in Jimma Zone road construction projects.

To determine the challenges of the existing project risk management practices in Jimma Zone road construction projects

To examine the critical project risks factors influencing the Road construction project.

This study focuses exclusively on road construction projects in the Jimma Zone and does not extend to other cities in the country. Consequently, the findings and conclusions may not be directly applicable to projects in other regions. Among the various stakeholders involved in the road construction sector, this research primarily considers consultants and contractors as the main sources of data. Since the aim of the paper is to evaluate the current risk management practices in city road projects, the scope has been limited to consultants and contractors who are actively engaged in ongoing or incomplete road construction projects within the Jimma Zone.

Literature Review

A project is not an ongoing business procedure. It has typical characteristics which are consecrated to assure that it is finished at a determined point. A project creates products that have not existed or never been done previously. A project is hence said to be unique. But, when we say “unique” in defining a project was criticized by (Raftery, 1996), who suggested that projects have similarities in operations, components and materials, management styles and structures and physical elements that form an equivalent function. According to (Winch, 2002), a project is all about creating value, which includes the interpretation of ideas and missions into physical activities and end products.

According to Dr. J. M. Juran, a project is a problem planned for solution. This definition shows that every project is implemented to solve some kind of problem for someone who is in need of. Projects unlike other activities, operations and tasks, being temporary and unique activity, show its identifiable aspects that differentiate itself from other activities. A project is a temporary effort undertaken to make a unique product or service. Temporary means that every project has a definite starting and a definite end. Unique means that the product or service is distinct in one way or other from other products or services.

The Project Management Knowledge areas are areas that describe project management knowledge and practice in terms of the various component processes.

Project risk management, which has been practiced since the mid-1980s, is one of the nine main knowledge areas of the project management institute's project management body of knowledge (Tuysuz, 2006). The Project Management Institute characterizes project risk as "an uncertain circumstance that, if it happens, has a positive or negative result on one or more project goals". This definition is important because, unlike in the past when project risk was exclusively assumed to direct to negative results, it is now recognized as the source of either possibilities or threats.

According to the Project Management Institute (PMI, 2004), project risk management is one of the nine most crucial parts of project commissioning. This reflects a firm relation between dealing risks and a project success. While RM is set forth as the most difficult area within construction management, its usage is promoted in all projects in order to keep negative consequences (Potts, 2008).

Project Risk Management is the processes concerned with identifying, analyzing, and responding to project risk. It comprises risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control.

Most of the time, risk in construction projects is conducted with in an arbitrary way (Potts, 2008). However, in recent years, risk control has been the main influential factor of project management (Serpella, 2014). Thevendranet (2004) defined the idea of powerful risk control as a constantly supervised coordinated system for defining purposes, identifying reasons of uncertainties, evaluating them and prepare responses to make suitable balance between risk and opportunities. This involves maximizing the probability and effect of positive activities and lowering the probability and consequences of unwanted activities to project goals (PMI, 2000).

Some studies argue that the concept of risk is understood in different ways, to the extent that certain definitions of risk can be disputed. According to (Keynes, 1921), risk is an uncertainty where matter of importance is defined as relative to the particular objectives of the project to be achieved. Risk is constantly available during decisions making on idea of possibility, expectations and estimates of the future. It characterizes conditions in which the result for a particular activity is likely to differ from the predicted value (Raftery, 1994). The definition of risk is various and could be assessed in phrases of causalities and accidents, pattern of a population, in phrases of like hood and reliability or in phrases of the possible consequence on a project.

Risk is regularly defined in phrases of results, or effect on project goals. Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objective (PMI, 2000). PMBOK Guide (2000) defines risk management is as the organized process of identifying, analyzing and responding to project risk. It contains increasing the chance and aftermath of advantageous activities and lowering the chance and aftermath of disadvantageous activities to the project objectives. A risk has a cause and if it occurs an effect. The book stated that project risk includes both treats to the project's objective and opportunities to improve those objectives. The book recommends that the organizations must be committed to addressing risk management throughout the project. One measurement of organizational commitment is its devotion to collecting data on project risks and characteristics.

Edwards & Bowen (1998) defines risk management as a systematic approach to dealing with risk. According to the above co-authors, "A risk management system should establish an appropriate context; set goals and objectives; identify and analyze risks; influence risk decision-making; and monitor and review risk responses". Cooper (2005) defines risk management as the culture, processes and structures that are directed towards the effective management of potential opportunities and adverse effects.

From the above two definitions, we can understand that the former was found to concentrate on the approaches and processes of managing risk, whereas the latter was focused on the process as well as the culture of managing the risk effectively. The project management body of knowledge (PMI, 1996), put risk management as one of nine parts of project management areas. Risk management composed of predicting, at the start of the project, unplanned events that may come up beyond the project manager's control. These events can undermine the achievement of project objectives.

There are many techniques or models used to dealing the risks in several projects but however the main system of risk control is composed of five stages in the construction industry. The technique used in risk management support to detect and find out all the risks to which the project is exposed. An implementation of the procedures during the lifecycle of the project, from planning to completion, for the construction project is required for the practice to be helpful (Loosemore, 2006). The risk assessment incorporates qualitative and quantitative risk analysis procedure. Between all phases, tracking and inspection guarantees the organization improvement on risk performance and learning ability from experience

PMBOK Guide (2017, p.401) defined plan risk management as the process of describing how to conduct risk managing activities for a development. Kerzner (2009) also describes risk planning as the Procedure of evolving and recording a prearranged, complete, and collaborative plan. It approaches for recognizing and examining risks, evolving risk, counteraction strategies, monitoring and controlling how risks have transformed. The fundamental benefit of this process is that it insures that the extent, type, and visibility of risk management are proportionate to both threats and the significance of the project to the organization and other stakeholders.

As (Banaitene, 2012) stated that risk identification is the most crucial step. The purpose of this step is to recognize of possible risk sources with high consequence on a specific project activity, if they occur. It is unimaginable to pick out all possible risks, and the goal must not be to do so (Smith, 2006). Therefore, what we have to do is to figure out and assessing the risks to make certain that possible risks are assessed and controlled in a way, which permits for the general goals to be accomplished. The primary step at the early phase of the project should form the basis by which strategies, policies, uncertainties and risks are devised when it comes to management and allocation (Potts, 2008). But, given that all risks are not completely recognizable before the beginning of a project and additional more risks might emerge throughout the implementation of the project, the identification of risk must be undergone in a way that is in accordance with the buildup of the project
In identifying and categorizing various project risks, one effective instrument is the risk breakdown structure. It is defined as “a source-oriented grouping of project risks that manages and defines the total risk exposure of the project. With the use of risk break down structure, we can create a hierarchical representation of the project’s risks, starting at the higher, general level and breaking the risks down to more specific risks at lower levels.
The different techniques for risk source identification normally consist of checklists, brainstorming, workshops, expert interviews and analysis of different scenarios as well as analysis of historical data and project plans. The technique of using experience or data from related projects allows for insights about common factors in a comparison among the projects. Checklist is a helpful instrument, which discuss risks recognized in past projects and the responses to those risks (Mhetre, 2016).
This is the stage where the identified risks are going to be further analyzed. The identified risk’s implication is defined quantitatively, before the response management stage. The goal of risk assessment and analysis is to set up the risk situations as absolutely as viable and rate them (Schieg, 2006).

There are two major categories distinguished on risk assessment. The qualitative analysis is a process that consists of interviews, checklists and brainstorming, while the quantitative analysis is acted through a data driven methodology. (Banaitene & Banaitis, 2012).

Qualitative risk assessment includes the evaluation of impact and the preparation of lists in order to additionally examine the recognized risks. (X.W Zou, 2007). Risk assessment using quantitative analysis displays the effect of each risk within high, low and the probability of occurrence.

The first step in risk analysis and evaluation process is to gather data to the risk exposure. This data might be past data gathered through past project experience by the contractor. In addition, the modeling of uncertainty of a risk exposure where the likelihood of happening is presented is described in terms of probability and potential consequences in financial monetary terms. The next thing to do is to assess the impact of those identified risks, using different methods like Monte Carlo simulation. The quantification of risks is the magnitude and frequency of each event could be a collection of happenings. Risks are divided in terms of their probability of happening and the magnitude of their impact. This permits a prioritization of the risks on the project in terms of them being possible to manage or not.

Risk response is justified if the risk is estimated to have extreme outcome on a level that could warrant a reappraisal of the overall project (Potts, 2008). One can use avoidance to address the risk by altering project plans in a manner that makes the risk irrelevant. This method promotes changing project plans to facilitate the elimination of the risk or to protect the project goals from the possible negative impact.

This method uses transferring the risks and consequences for third parties who are willing to accept responsibility for its management and the liability of the risk (Mhetre, 2016). It includes the use of both contracts and insurance to transfer liability to other parties. The main purpose is to ensure that the risk is owned and managed by the party best able to handle the task successfully.

The purpose of this technique is to mitigate the risk by changing the scope of the project to minimize the likelihood of the damaging event occurring (Winch, 2010). Enforcing risk management early in the project to lower the probability of the risk event happening is more effective than trying to repair the damage and consequences of the risk has passed. The mitigation of risk may be done by adopting less complex processes so that the probability of impact is lowered, other forms of action is adding resources and extra time to the schedule (PMI, 2000). Flanagan (2007) proposes enforcing an altered construction strategy and the use of other materials to minimize possible risks,

In fact, it is impossible to take benefit of all possibilities and dispose all threats of the project; however it is possible to be conscious of the threats and opportunities via documentation and identification of them. Risk response is applied when it is not feasible to respond to the risk by the other strategies. This stage is all about taking a conscious risk and to handle with the results as they occur. The decision not to change any project plans to handle with the risk or engaging in any other response strategies (Cooper, 2005).

According to (Winch, 2002) this process is significant because the data and information collected should be monitored and documented for eliminating past risks from emerging again and to control identified risks. Continuous monitoring and inspection of capable risks is essential for the implementation of the risk management process. Risk monitoring assures new risks are noticed and controlled. The project manager should monitor a list of the risks that have been identified for risk treatment action.

From the starting phase, road construction projects are vulnerable to risks (Schieg, 2006). Therefore, from the early stages of a project the effectuation of risk control is fundamental because of the reality that decisions such as choice of alignment and selection of production techniques could be stimulated at some point of the stage (Eskesen, 2004). Looking into risk activities in the planning stage of the project life cycle is effective because information about the risks might come forth, helping the implementation of a strategic approach to be defined and adopted from the very beginning of the project cycle. This will in turn assist clarify project objectives and priorities, in addition bring an improved cost, schedule cost for the project (Reilly & Brown, 2004).

By incorporating risk management into the planning phase, one can facilitate the identification and reduction of possible risks for the project achievement of its objectives. Construction with unique nature of characteristics and specific participants of stakeholders working together is full of unpredictability. One Construction projects differ from the other in one way or other. The appropriate way of reducing risk in construction projects is to be fully organized for everything that might go against the plan. Previous studies of several authors try to identify different risk factors and categorize them in to internal and external risks which will occur in construction projects. From their study, we can understand that external risks are risks that are outside the control of the project team. These kinds of risk are like political risks, economic risks, legal risks, social risks, and nature risks. But internal risks are risks the project faces because of its unique characteristics. These risks could be design risks, construction risks, financial risks, management risks and maintenance risks. According to the PMBOK Guide, the risks are categorized into such groups: technical, external, organizational, environmental, or project management.

Empirical literature

The study carried out by Adhikari R, Roshan & Mishra AK, Anjay (2020) entitled with "Strategic Risk management practice in urban Road Construction project of Nepal" was a journal of advanced research conducted to analyze the risk management practice in road construction project for the cities of Shiddharthanagar Municipality, Rupandehi, Nepal from contractor's and client's position. The research prepared questionnaire survey to collect the primary data using convenient sampling of the partially or fully completed project. The findings of the research revealed that from the contractor's side, more than 60 % of the respondents believe that top management are not aware of risk management. From client's perspective, 80 % of the respondents believe that their top management is fully aware of risk management. This result shows us that relatively top managements are aware of risk management practice. Up on their research result, they concluded that risk should be implemented by one who is capable of managing the specific risk by managing contractual responsibility with appropriate contract administration practices for ensuring the project goals. There should be a risk register at the site and frequent meetings should be conducted to identify the risks. The identified risk should be documented decently to assure knowledge for projects in the future. Clients and contractors should conduct continuous training programs to advance managerial and financial practices to explain the internal and external risk affecting the road construction industry and to initiate the proper ways to deal with such factors. The government, non-government, clients as well as contractors should develop a risk management manual so that probable risks are mitigated before and during construction. We can understand the study was limited to those cities only; as a result the findings might not work for other cities of the country.

(Kishk, Mohammed, Ukaga & Chioma, 2008) conducted a study aiming to assess the impact of Effective Risk Management on Project Success Association of researchers in construction management. The article was written with the primary purpose of investigating the impact of effective risk management processes on project success. The article identified some factors which are critical for success of a project. These include definition of clear goals, management support, detailed project plan, a defined control mechanism, competent and technically able project team. The outcome of the study demonstrated that there was actual and direct relation between the efficient risk management and project achievement of its objective up on the relation. Likewise, it can be indicated that the more effective continuous risk management implemented in a project, the higher the chances of project success.

Besides, it can be argued that effective continuous risk management leads to the higher the opportunities of achievement of its goals. In addition, the study revealed that viewing a project only in terms of cost, time and quality objectives is not only proper to conclude that the project is successful. A project has to have its own predetermined and accepted success criteria to evaluate each project milestones and the overall result of the project.

(Okate Anmol, Kakade and Vijay, 2019) performed a research study which focuses on Management of Risk on Road Construction Projects. Roads for the study purpose are divided high or low, depending up on the number of commercial vehicles they entertain per day. The identification of risk is done through a questionnaire survey and the five point likert scale was used twice for the purpose of determining probability and impact of the risk factor. The Preliminary results of the study indicated that the top five most significant risk factors in road construction projects are (1) Delay in payments (93.33%) (2) Owner Bankruptcy (91.11 %) (3) Unclear definition of the project scope (91.11%) (4) Lack of leadership quality of project manager (88.89 %) and (5) Poor site management and supervision by the contractor (86.67%). In the study, it was stated that the above results may differ if the parameter of probability of the risk factors is also included. As a limitation, the study was unable to reveal what results we could get if probability of the risk factors included.

(Emran Hassen Abdu, 2017) conduct a study with purpose of developing conceptual risk Management Framework for AACRA. The study was approached with questionnaire to major stakeholders that play predominant roles in the road projects. This includes Contractors, Consultants and Clients. The inputs data are analyzed using risk register response validity testing, mean square, cumulative mean square and correlations and ranking. According to the study, the construction industry has had a very poor reputation for coping with these, with many projects failing to meet deadlines, and cost and quality targets. The questioner survey revealed that the respondents are aware of risk management only through earlier university learning. Scope, and Design Change and Bad weather conditions in their ranking order are the most critical risk factors attacking the AACRA. The risk factors are ranked based on their effect on overall project goals and objectives. The technical risk factors are the major sources to the authority. As it was already mentioned, stakeholder's knowledge about risk management is limited to their previous university learning and this creates a discontinuity in the practice of using risk management practice in the authority. The study also tries to develop Conceptual Risk Management Frame work for AACRA with the goal to minimize the impact of various project risks through proper mitigation plans for achieving project success.

The purpose of a case study done by (Ewelina Gajewska and Mikaela Robel, 2011) was to assess how the risk management process is applied in the construction industry and how professionals are dealing to risks in project activities. The authors discovered that risk is understood in relation with a negative event, even though in theory it can have two dimensions. Professionals in the construction industry are using methods described in the literature concerning risk management, but are not aware of it. The study is limited as it does not provide the best possible ways for professionals to understand and implement risk management tools. In addition, the study was unable to provide reasons why risks are being managed every day in the industry, but not in such a structured way as the literature dictates.

Research Methodology

The general objective of this study is to identify the existing risk factors and their impacts. This chapter addresses the methodology that is utilized to achieve the research Objectives. It was viewing the research approach and design, sampling techniques, data collection techniques and procedures, description of study variables and measurement, and finally data analysis and techniques.

Research Approach and Design

According to Redman and Mory (1923), research is an organized, scientific, and systematic effort to gain new knowledge on a particular subject. (Kothari, 2004) explains the plan, roadmap, and blueprint strategy of investigation conceived to obtain answers to research questions that make up a research design. It constitutes the plan for the collecting, measuring, and analyzing of data.

A descriptive approach is carried out to describe and assess the probability of risk factors with a high probability of occurrence and highly affect the objectives of the project's success. With this research approach the state of current risk management practice of road construction projects is going to be studied through a process of data collection that enables to describe and evaluate the challenges in risk management practice more completely, develop a hypothesis, and propose associations.

Source Population and Target population

Even though all participants that participate in road construction projects play a significant role in the completion of the project, consultants, Designers, Suppliers, clients, and contractors are more related to a high degree of risk owing to the characteristics of the road construction industry. Professional Engineers, Technical Managers, Project Managers, Technical supervisors, and Risk Supervisors are selected from the Target population.

Sample Size

According to Jimma Town Road Construction Authority, presently the total number of grade one road construction companies and road construction consulting companies who have already signed a contract with a road construction authority and currently working on ongoing road projects in the city are as follows.

Total number of Grade One Road contractor companies (N) = 18

Total number of Grade One Road Consultant companies (N) = 11

Sampling Techniques

The sampling design that were employed for this study is a non-probability sampling. A non-probability sampling provides an information-rich case study that enables one to explore the research question and gain theoretical insight (Saunders, Lewis & Thornhill 2009). Purposive sampling were the best fit for this study, as our sample size is relatively small. Purposive/judgmental sampling is often used when working with a small population and enables us to select cases that best fit to answer the research questions and meet objectives (Saunders et al., 2009)

Data Collection Techniques and Procedures

This research focuses on the study of current Risk management practices on Road Construction Projects in the Jimma Zone. To achieve the research objectives, relevant data were collected from both primary and secondary data sources. First of all, the primary data were collected from primary data sources which were acquired from questionnaires. According to Sileshi (2009) questionnaire is a type of survey where several respondents are asked identical questions to gain information. The information gathered going to be analyzed to find out patterns and any comparisons in the result of the questioner.

Secondly, the secondary data sources; which include desk studies, books, previous research, publications, and journals are used to distinguish critical risk factors that influence the performance of the road construction sector.

Data Analysis

The research were conducted using a questionnaire survey to validate the findings of the study. The questionnaire were compiled based on a compiled list of risks involved in road construction projects for quantitative study. The quantitative study were conducted to measure the variables identified from the literature.

The respondents were asked to rate all the risk factors related to road construction projects on a 5-point scale to determine their probability of occurrence. The collected data are going to be analyzed using quantitative data analysis techniques. The data collected from close-ended questions of the questionnaire is analyzed by descriptive data analysis methods using Statistical Package for Social Science (SPSS). The respondents were requested for each factor to rate using a point scale of 1 to 5 were adopted. It was categorized as follows 5=very high; 4=high; 3=medium; 2=low; and 1=very low. Secondly, the secondary data sources; which include desk studies, books, previous research, publications, and journals are used to distinguish critical risk factors that influence the performance of the road construction sector.

Results and Discussion

A total of 29 questionnaires were distributed to General Managers, Deputy Managers, Technical Managers, Project Managers, and other professionals representing contractors and consultant sectors. All 29 questionnaires were returned, resulting in a 100% response rate, which is considered highly reliable.

This chapter presents the analysis of the collected responses. First, risks with a high probability of occurrence and significant impact on project cost and completion time were identified. Then, based on the third section of the questionnaire, the risk response methods most highly rated by participants were examined for each risk factor.

The questionnaire consisted of three parts. The first part gathered general information about the participants. The second part applied Likert-scale questions to assess the probability of risk occurrence. The third part contained multiple-choice questions designed to identify preferred response strategies for each type of risk. Respondents were grouped into two categories: contractors and consultants. Of the 29 distributed questionnaires, 18 were completed by contractors and 11 by consultants. All responses were valid and included in the analysis, providing a comprehensive dataset for the study.

Table 4-1 : Respondents Response Rate

Sample Size	Company	No of Respondents	Percentage
11	Consultant	11	100%
18	Contractor	18	100%
Total		29	100
	Source: Own Survey (2024)		

General Profile of Respondents

This section of the questionnaire considered to obtain the general profile of respondents. It includes respondent's job position the company, educational level, and years of experience on a project and field of specialization.

i. Respondents job position the company

Table 4-2: Respondents Job Position in the company

		Frequency	Valid Percent	Cumulative Percent
Valid	General Managers	6	20.7	20.7
	Deputy Managers	3	10.3	31.0
	Technical Managers	8	27.6	58.6
	Project Managers	10	34.5	93.1
	Others	2	6.9	100.0
	Total	29	100.0	

Source: Own Survey (2024)

Respondents selected from a wide range of professions that include General Manager to Project Managers. The overall groupings of respondents presented according to their job positions; General Manager 20.7%; Deputy General Manager 10.3%; Technical Manager 27.6%; Project Manager 34.5%; and others 6.9% are project coordinators. (Table 4.2) The above table shows that all of the participants are top company managers and project leaders which make sure that respondent are in a good position and have good insights about the projects the company runs.

ii) Respondents educational level in the company

Table 4-3: Respondents educational level in the company

		Frequency	Valid Percent	Cumulative Percent
Valid	Diploma	2	6.9	6.9
	B.Sc.	7	24.1	31.0
	M.Sc.	20	69.0	100.0
	Total	29	100.0	

Source: Own Survey (2024)

Table 4.3 displays the general groupings of participants according to their educational status. 6.9% of respondent's educational status Diploma holders, 24.1% were holding second degree and 69.0% are holders of Master degree. So the level of education of the respondents is a bachelor's degree and above. This implies the majority of the workforce has enough educational background and understandings to easily understand about project risk management concepts and practices which helps research to achieve its objective.

iii) Respondents working experience on a project

Table 4-4: Respondents Working experience on a project

		Frequency	Valid Percent	Cumulative Percent
Valid	less than 2 years	1	3.4	3.4
	2-5 Years	1	3.4	6.9
	5-10 Years	11	37.9	44.8
	above 10 Years	16	55.2	100.0
	Total	29	100.0	

Source: Own Survey (2024)

As indicated in Table 4.4 from all of respondents 55.2 % constituted above 10 years of experience, where as 37.9 % constituted from 5 up to 10 years. The experiences the respondents have on projects and relevant works is a good advantage to identify possible risk factors and allocation of response strategies in road construction projects in particular. This makes them as dependable and credible sources of information, which is vital to realize the research objective.

iv) Respondents Project Risk management training

Table 4-5 : Respondents Project Risk Management Training experience in their company

		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	10	34.5	34.5
	No	19	65.5	100.0
	Total	29	100.0	

Source: Own Survey (2024)

As indicated in Table 4.5, only 34.5 of the respondents have a history of project risk management training in their company. The above table shows that the companies are not too good in giving project risk management training to their employees and updating their knowledge about project risk management which possibly weakens their efficiency in dealing with project problems.

v) Respondents field of specialization

Table 4-6: Respondents field of specialization

		Frequency	Valid Percent	Cumulative Percent
Valid	Engineering	8	27.6	27.6
	Project Management	10	34.5	62.1
	Construction Management	7	24.1	86.2
	Other	4	13.8	100.0
	Total	29	100.0	

Source: Own Survey (2024)

As the above table entails, staffs with different field of specialization in the project contributes to improving project performance and help to lessen risk as the different perspective have a positive impact.

Risk identification

Risk management is composed of mainly four steps: risk identification, risk analysis, risk response and monitoring risk. In this paper, we are going to focus on the 1st three parts. In this section, the results of descriptive analysis done via SPSS 20 of the rating of the risks identified through literature review are discussed.

Mean scores and ranking mechanism are used to rate the probability of occurrence of various risks based on contractors and consultants view.

As indicated in Table 4.6 above, risk factors rated based on the assessment and probability of occurrence and their impact on project cost and time from the overall insight of respondents.

Table 4-7 : Probability of risk factors occurrence, impact on cost and completion time of project generated based on contractors, consultants responses

Descriptive Statistics								
			Probability of occurrence		Impact on cost of the project (budget)		Impact on completion time of the project	
	Risk Factors	N	Mean	Rank	Mean	Rank	Mean	Rank
	1. Design Risks							
1.1	Defective design	29.00	4.21	2	4.03	3	3.59	7
1.2	Not coordinated design (structural, mechanical, electrical, etc.)	29.00	3.62	15	3.72	10	2.79	31
1.3	Inaccurate quantities	29.00	3.41	22	3.34	26	2.76	32
1.4	Lack of consistency between bill of quantities, drawings and specifications	29.00	3.66	13	2.90	39	2.59	38
1.5	unqualified designers	29.00	3.76	9	3.76	8	3.14	17
	2. Construction risks							
2.1	Rush bidding	29.00	3.03	34	3.55	16	2.55	40
2.2	Gaps between implementation and Specification	29.00	3.59	17	3.69	12	2.59	38
2.3	Labor productivity	29.00	3.59	17	3.24	32	3.62	6
2.4	Design change	29.00	3.79	8	3.76	7	3.55	8
2.5	Labor disputes	29.00	2.83	36	3.38	23	2.69	33
2.6	Site condition	29.00	2.97	35	2.48	45	3.14	17
2.7	Equipment failures	29.00	3.83	7	3.76	8	3.14	17
2.8	Lower work quality due to time constraint	29.00	3.38	24	3.34	26	3.28	15
2.9	Lower work quality due to workman ship	29.00	3.69	11	2.97	38	3.03	21
2.10	Construction procedures	29.00	3.66	13	3.69	12	3.41	13
2.11	Actual quantity differs from the contract	29.00	2.72	38	2.76	43	2.48	43
	3. Physical risks							
3.10	Damage to structure	29.00	2.69	40	3.38	23	3.00	22
3.20	Damage to equipment	29.00	3.93	5	3.28	30	3.31	14
3.30	Labor injuries	29.00	3.28	29	2.86	40	2.83	29
3.40	Supplies of defective material	29.00	3.41	22	3.17	35	2.90	27

.50	Theft	29.00	3.10	33	2.83	41	2.45	44
	4. Organizational & Managerial risk							
4.10	Contractual relations	29.00	3.69	11	3.41	19	3.14	17
4.20	Contractors experience	29.00	3.72	10	3.59	15	2.62	36
4.30	Attitudes of participants	29.00	3.55	20	3.41	19	3.00	22
4.40	Inexperience work force	29.00	3.45	21	3.24	32	2.69	33
4.50	Ambiguous Planning due to project complexity	29.00	3.28	29	3.41	19	2.69	33
4.60	Resource management	29.00	3.59	17	4.28	1	3.69	4
4.70	Poor communication between involved parties	29.00	3.38	24	3.28	30	2.86	28
	5. Financial Risk							
5.10	Inflation	29.00	4.31	1	4.10	2	3.66	5
5.20	Payment delays	29.00	4.10	3	3.72	10	3.72	3
5.30	Material cost	29.00	4.03	4	4.03	4	3.76	2
5.40	Exchange rate fluctuation	29.00	3.38	24	3.97	5	3.48	11
5.50	Low market demand	29.00	2.83	36	3.21	34	2.93	26
5.60	Financial failure of the contractor	29.00	3.86	6	3.45	18	3.83	1
	6. Socio- political and legal risks							
6.10	Changes in laws and regulations	29.00	3.14	32	3.34	26	2.83	29
6.20	Pollution and safety rules	29.00	2.31	43	3.14	36	3.00	22
6.30	Bribery/Corruption,	29.00	2.72	38	3.31	29	2.45	44
6.40	Language/Cultural barrier	29.00	1.86	45	2.55	44	2.55	40
6.50	Law & order	29.00	1.97	44	3.38	23	2.62	36
6.60	War and civil disorder	29.00	1.45	46	2.00	46	1.62	47
6.70	Requirement for permits and their approval	29.00	2.55	42	3.55	16	3.52	9
6.80	Legal disputes among the parties in the contract	29.00	3.38	24	2.83	41	3.00	22
	7. Logistics Risks							
7.10	Unavailable labor, material and equipment	29.00	3.62	15	3.69	12	3.52	9
7.20	Undefined scope of working	29.00	3.24	31	3.83	6	3.28	15
7.30	High competition in bids	29.00	3.38	24	3.03	37	2.55	40
	8. Environmental risks							
8.10	Natural disaster	29.00	1.45	46	1.86	47	2.00	46
8.20	Adverse weather condition	29.00	2.66	41	3.41	19	3.48	11

In road construction industry, as seen in literature review, there are eight main risk factors. Within these risks there are 47 risk factors. In this section, we analyze which risks have the highest probability of occurrence from the 5-point Likert scaled questioners gathered. The scale ranges from 1 to 5: 1= Very Low probability, 2= Low probability, 3 = probability of occurrence, 4= highly probability and 5= Very Highly probability and 0= No Probability 1= Very Low Probability, 2= Low Probability, 3 = Probability, 4= High Probability and 5= Very High Probability.

1.1.1 It is displayed that " inflation ", "site condition", "defective design", "payment delays", "material cost", "damage to equipment", "financial failure of the contractor", "equipment failures " and "unqualified designers" were the 10 major risk factors identified according to their hierarchy. Nevertheless, in this study, top 4 critical risk factors with highest frequent occurrence are discussed.

From Table 4.7 above, the finding shows that at present time inflation is the first ranked risk factor with high probability of occurrence and most critical in the road construction industry, with a mean value of (4.31).

Inflation is a measure of the rate of rising prices of goods and services in an economy. Inflation can happen as prices rise owing to increases in manufacturing costs, such as raw materials and wages. Inflation is also the decline of purchasing power of a given currency over time.

According to the study done by Solomon Melaku Belay, Seifu Tilahun, Mitiku Yehualaw, Jose Matos, Helder Sousa and Endalew Temesgen Workneh (2021) the second delay risk factor with a Mean Score of 4.48 is inflation. It was showed that unexpected fluctuations in prices of construction materials including equipment and fluctuations in foreign currency exchange rates interrupt the performance of infrastructure construction projects, which in turn leads to project delays and controversies among stakeholders.

The outcomes achieved from this study were in alignment with the findings of the study done by Z. Rachid, B. Toufik, and B. Mohammed, vol. 19, no. 5, pp. 371–381, 2019, Whose research studies have determined that the top risks factors causing cost overrun in the building and road projects are inflation.

Enshassi, Adnan & AbuHamra (2015) performed study to name the reasons of delayed payment and nonpayment issues in construction projects in Gaza Strip from subcontractors' perspective. Delayed variation orders payment was found as the most frequently problem faced by subcontractors which has led to disputes. The results revealed that most disputes were resolved through negotiation within three months. The findings showed that the inclusion

of the arbitration clause in the contract is the most significant effective way to solve the payment and dispute issues in construction projects in Gaza Strip.

The study also ranked "material cost" with the mean value of 4.03 as the fourth critical risk factor with highest probability of occurrences as of contractors and consultants observation. Material cost is the cost of raw materials available to proceed with the project. Material cost rises are the increases in the prices of a raw materials and commodities.

Among forty seven risk factors the top four critical risk factors with highest impact on project cost and completion time are discussed. According to the research resource management was perceived as the top rank risk factor affecting project cost. Inflation and defective design materials cost are assessed as the second, third and fourth most important factors affecting project cost.

From **Table 4.7** above, the finding show that at present time Resource management is the first ranked risk factor with high impact on project cost or budget among other risk factors construction, with a mean value of 4.28 and the fourth risk factor with a mean value of 3.69 affecting project completion time

According to Nagaraju (2012), resources are items used to carry out the whole project properly, namely, labor, material and equipment. Material resources comprise shortages and changes in material, late delivery, and damage of material.

Labor force involves scarcity of labor, and inadequate skills. Furthermore, equipment related like failure and lack of equipment. In addition, Kermanshachi, (2018) found that the schedule performance was severely affected by resource risk. Moreover, Zubaidi (2008) pointed out that the availability of labor, materials and equipment and the decline in labor productivity are the main reasons for failure to complete the project on time.

According to this research the second risk factor with highest impact on project cost with the mean score of 4.10 is inflation.

Financial aspects of projects include financial necessities and making payments on time. Wu et al. (2017) found that the problem of inflation was the key risk which had an impact on project cost. Another study by Anton (2011) indicated that price escalation of material and inflation can lead to the cost overrun of construction projects. Furthermore, Zailani (2016) reported that inflation was the foremost cause of risk in construction projects that generate effect on performance of construction projects.

According to this research the third risk factor with highest impact on project cost with the mean score of 4.03 is defective design.

Andi (2006) reported that defective design was the most serious and common risk followed by incorrect and insufficient design information, inconsistent information among design documents, and unrealistic design (constructability issue). In addition, Wu (2017) found out that risk related to design such as inadequate site information resulting in improper design had an effect on project performance.

Santoso (2003) in his study found that in Indonesia, the limited design fee allotted by the owner would cause the designer to provide defective design.

The findings by the study of Ogunlana (1996) also showed that most project delay (on 75% of the projects studied) was caused by incomplete design. According to the study Unqualified or shortages of personnel involved in project design due to work overload in the firm designing the project were recognized as the most important reasons causing defective construction drawings.

Inconsistency between specifications and drawings are main reason for defective design. These were the most frequent problems perceived by contractors resulting from defective design. They were thought to have probably arisen because of lack of coordination between designers and lack of supervision among draftsmen in the design phase.

The prices of steel, Ferro, cement and other raw materials required for road construction had increased dramatically over a few months. These materials are usually used in road projects, indeed, steel, Ferro, cement are intensively used at the early stage of such projects in the form of reinforcing bars and frame work for the building structure. As indicated, most of the construction projects were in the early stages, and consequently, most of them were influenced by these bad effects. These materials are also used to a lesser intent for finishing components, so other contracts, which were surveyed in the middle and final stages of construction, were inevitably influenced by this impact.

Risk response

As discussed in the literature review, after identifying probability of occurrence of risks with highest probability of occurring and their impact on project objectives, the next step is developing a strategy that helps minimize the negative effects of the risks through the identified risk response methods. In this section, the response choice of the participants for the risks were analyzed and summarized in the table below.

Table 4-9 : Risk response

	Risk Avoida Nce	Risk Trans fer	Risk Mitigati On	Risk Accepta nce	Risk Expl oit	Risk Share	Risk Enhan ce	Contingency Plan
Defective design	8.80%	70.00 %	8.50%	2.00%	2.90 %	3.60 %		4.20%
Not coordinated design (structural, mechanical, electrical, etc.)	20.80%	10.30 %	40.90%	5.60%	9.30 %	4.90 %	7.90%	0.30%
Inaccurate quantities	12.30%	21.70 %	20.80%	11.60%	5.80 %	20.00 %	4.90%	2.90%
Lack of consistency between bill of quantities, drawings and specifications	7.80%	40.00 %	14.70%	7.90%	9.10 %	4.80 %	12.60 %	3.10%
unqualified designers	30.30%	20.30 %	9.00%	24.50%	12.40 %	3.50 %		
Rush bidding	8.10%	4.20%	16.70%	19.40%	15.90 %	9.30 %	4.20%	22.20%
Gaps between implementation and Specification	26.30%	5.00%	15.20%	5.00%	35.00 %	2.20 %	8.80%	2.50%
Labor productivity	12.80%	8.60%	15.70%	15.70%	22.90 %	1.40 %	14.30 %	8.60%
Design change	10.40%	15.70 %	13.00%	12.90%	10.40 %	20.80 %	10.30 %	6.50%
Labor disputes	15.70%	1.40%	30.00%	15.70%	4.30 %	15.90 %	4.30%	12.70%
Site condition	10.40%	5.20%	40.40%	15.10%	10.50 %	5.80 %	4.80%	7.80%
Equipment failures	10.70%	4.30%	5.40%	50.00%	4.30 %	1.90 %	2.40%	21.00%
Low quality due to time constraint	24.90%	2.50%	20.70%	11.40%	12.70 %	7.60 %	6.30%	13.90%
Low quality due to workman ship	64.00%	1.40%	5.00%	18.10%	5.90 %			5.60%
Construction procedures	10.50%	2.60%	33.00%	10.00%	4.10 %	6.80 %	30.30 %	2.70%
Actual quantity differs from the contract	6.00%	17.20 %	13.10%	8.00%	35.60 %	7.00 %	10.70 %	2.40%
Damage to structure	32.00%	8.00%	9.00%	30.90%	6.10 %	10.00 %		4.00%
Damage to equipment	30.30%	9.20%	10.10%	12.00%	1.30 %	9.20 %	2.10%	25.80%
Labor injuries	50.70%	7.40%	10.80%	7.60%	9.90 %	2.50 %	2.50%	8.60%
Supplies of defective material	42.70%	6.00%	26.20%	10.10%	6.10 %	2.60 %		6.30%
Theft	50.30%	9.10%	16.00%	5.00%			9.20%	10.50%
Contractual relations	23.60%	3.70%	20.20%	16.00%	10.60 %	17.30 %		8.60%
contractor"s experience	35.50%	5.60%	10.50%	16.00%	8.70 %	6.20 %	6.20%	11.30%
Attitudes of participants	36.40%	1.40%	10.00%	4.60%	11.10 %	26.70 %	5.60%	4.20%
Inexperience work force	50.60%		14.10%	7.00%	2.80 %			25.50%
Ambiguous Planning due	14.10%	4.20%	28.90%	8.30%	18.10	15.30	6.90%	4.20%

to project complexity					%	%		
Resource management	42.80%	1.30%	13.30%	25.60%	1.80 %	15.20 %		
Poor communication between involved parties	35.50%	1.30%	33.80%	15.30%	8.00 %	6.10 %		
Inflation	2.50%	7.40%	23.80%	10.60%	2.50 %	39.90 %	2.50%	10.80%
Payment delays	2.50%	10.60 %	50.50%	27.60%	4.70 %	4.10 %		
Material cost	1.20%	6.10%	50.00%	16.20%	1.20 %	10.00 %	1.00%	14.30%
Exchange rate fluctuation	1.30%	12.80 %	44.00%	17.10%	5.40 %	12.90 %	2.60%	3.90%
Low market demand	5.30%	6.70%	8.00%	32.70%	23.30 %	2.70 %	8.00%	13.30%
Financial failure of the contractor	14.10%	2.10%	26.80%	29.20%	5.10 %	3.00 %		19.70%
Changes in laws and regulations	5.10%	17.50 %	10.10%	55.40%	5.10 %	5.50 %	1.30%	
Pollution and safety rules	15.50%	5.60%	15.50%	46.00%	2.00 %	12.60 %		2.80%
Bribery/Corruption	20.20%	4.10%	22.90%	34.00%	4.10		12.00	2.70%
Language/Cultural barrier					%		%	
Law & order	10.50%	5.60%	10.50%	56.30%	1.40 %	10.10 %	2.80%	2.80%
War and civil disorder	10.10%	10.20 %	9.00%	14.40%		25.60 %		30.70%
Requirement for permits and their approval	4.00%	18.00 %	34.00%	30.70%	4.00 %	9.30 %		
Legal disputes among the parties in the contract	24.70%	8.10%	28.30%	6.80%	5.60 %	23.70 %		2.80%
Unavailable labor material and equipment	30.70%	4.40%	15.40%	16.10%	5.90 %	5.90 %	10.90 %	10.70%
Undefined scope of working	11.00%	15.10 %	14.90%	25.10%	9.60 %	3.80 %	20.50 %	
High competition in bids	5.40%	10.00 %	46.50%	20.10%	4.50 %			13.50%
Natural disaster	4.40%	10.10 %	6.40%	20.80%	10.80 %	25.50 %	4.40%	17.60%
Adverse weather condition	10.30%	10.00 %	12.00%	7.30%	10.70 %	31.00 %		18.70%

Source: Own Survey (2024)

In the above table the percentage of the responses of the participants for risk response is shown. In the previous section, the risks that have a high probability of affecting the project objectives are identified. The graph below will summarize the recommended response methods by participants for the risks that have high effect on road construction project objectives.

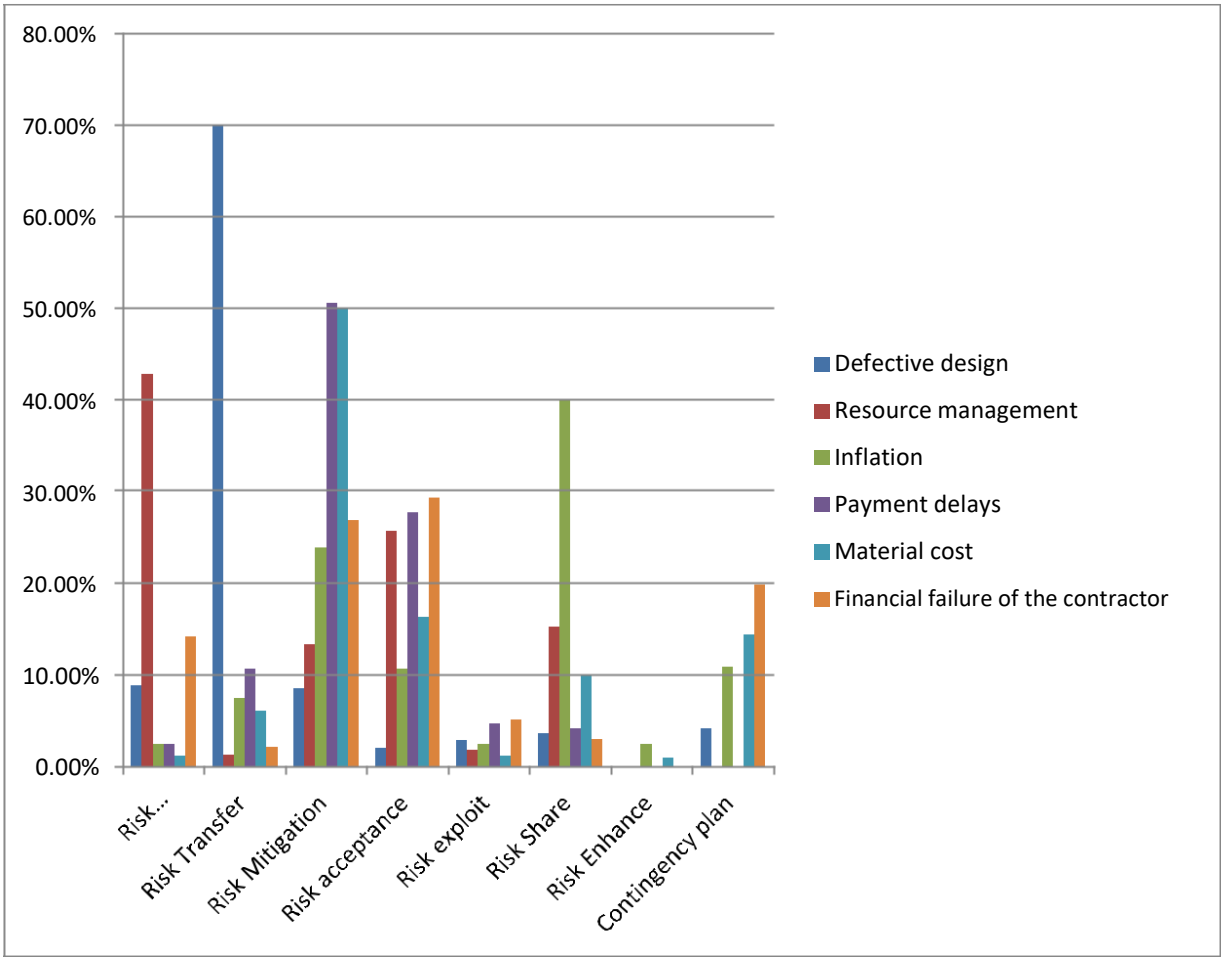

Figure 4-4 : Risk response for risk factors with high impact on project cost and time

Conclusions and Recommendation

Conclusion

Construction is a risky operation and risk identification is a challenging task as evidenced by projects exceeding budget, going beyond schedule, and having compromised specifications (Hillson, 2002). Construction projects can be very complicated and fraught with uncertainty. Construction projects may suffer negative effects from risk and uncertainty. One of the nine knowledge areas promoted by the Project Management is risk management. Additionally, risk management in the context of road construction project management is a thorough and organized method of detecting, evaluating, and dealing with risks in order to meet project objectives. According to literature, risks must identify before they can be controlled or mitigated. Accordingly, this study concludes that risk identification should be considered as the single most significant activity of the risk management on a project and should be tackled in a systematic way. Risk identification techniques as concluded from this study includes the following techniques namely: Brainstorming, Interviews/Expert Opinion, Questionnaires, Delphi technique, Expert systems, Checklists and Documentation review. The identification and analysis of risks, as well as the enhancement of the processes for managing road projects and the efficient use of resources, are all advantages of the risk management process. Road projects frequently experience cost overruns and schedule delays because the road construction sector is highly risk-affected by complex and changing project conditions that increase uncertainty and risk. Therefore, risk analysis and management are still a key component of project management for road construction projects today in an effort to handle uncertainty and unforeseen events efficiently and successfully complete projects. This study, therefore, has identified, ranked their probability of occurrence, determined their impact, the prevalent response trends for the major road construction risk factors considered by grade one contractors consultants operating in Jimma Zone.

Recommendations

Based on the findings of the study, it recommended that consultants, contractors, Government and other stakeholders consider the following areas of improvement in managing risk for road construction projects in Jimma Town.

Improving communication between the construction parties on the same site is very significant for any construction cost and time controlling. The sharing of information regarding risks on projects, as well as having a common priority of project can ensure that everything possible is done to reduce the chance of time delay and cost overrun.

- A realistic and accurate estimate could be helpful in developing an active strategy for controlling the overruns of both time and cost of the construction projects.
- Consultant and contractors should strive to ensure effective management of time, cost and quality management in road construction industry.
- To address the cost overrun problem, it is necessary to develop a technique for formulating the budget at the start of the project by considering the inflation aspect before finalizing the budget estimation.
- An efficient and effective materials procurement strategy to preclude potential late deliveries.
- Direct involvement of clients in the design phase of projects for minimizing change orders, especially during the construction stage.
- Periodic training programs offered by construction firms to technical personnel to keep them informed of the latest technology available for improving the quality level of the workforce, and may yield considerable savings in time, efforts, and costs associated with the extensive training and development, which may otherwise be required for unskilled operatives and poorly trained technical staff.
- it is recommended to explore and quantify the "effects" of the risk factors explored, especially those perceived as most significant
- Implement effective policies and programs that increase accuracy and proper identification and management of risk. This is because proper risk identification policies can assist in risk reduction and management.
- Stronger financial policies that can assist in keeping inflation rates at levels that are as low as possible are needed in order to counter the problem of material increases and other price related matters.

  Having in place a well-documented procedure which should be a one stop solution to all threats that are likely to occur during project life cycle.

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