CONSTRUCTION PROJECT MANAGEMENT PRACTICE IN ETHIOPIA: THE CASE OF ETHIOPIAN FEDERAL ROAD CONSTRUCTION PROJECTS

A PROJECT WORK SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF PROJECT MANAGEMENT (MAPM).

SCHOOL OF COMMERCE

COLLEGE OF BUSINESS AND ECONOMICS

BY

TEWODROS MERSHA

ADDIS ABABA, ETHIOPIA

JUNE 2023

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ENDORSEMENT

This project work has been submitted to Addis Abeba University college of Business and Economics School of Commerce, Graduate Studies for examination with my approval as a university advisor.

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Advisor Signature

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LIST OF ACRONYMS

RSDP - Road Sector Development Program

ERA- Ethiopian Road Authority

MOWUD - Ministry of Works and Urban Development

RoW – Right of Way

PM - Project Manager

BOQ – Bill of Quantity

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ABSTRACT

Road infrastructure is one of the significant components of construction and has great contribution to attain sustainable development of the country economy. In construction of road projects most of the study shows construction project management in Ethiopia has at low level of achievement and it is mainly described by excessive time overrun, cost overrun & quality problems. Hence, to fill the gaps this research conducted to assess construction project management practice & to identify the critical factors that affected the project performance in terms of time, cost, quality & Scope. In this regard data gathered from the targeted population of the client, contractor, and consultant of managers and engineers who are better experienced on the areas. In the total of 40 questionnaires were collected, by interviewing in mixed research approaches and analyzed data using Microsoft office. The investigation on practice of time, cost, quality and scope management revealed that, time and cost management found at critical low level, but quality and scope found medium to acceptable level of practice. In addition, by investigating the real extent of time and cost overruns of the road construction projects, secondary data collected from 84 road projects which are awarded to Ethiopian contractors from beginning of 2018 to end of 2022 which are the projects under construction and by taking their recent cumulative progress the data analyzed by using Microsoft Office Excel 2019. The investigation found that 100% of the road construction projects are behind the schedule and their average rate of time overrun is 38%. Regarding to cost overrun the study found the total additional cost variation granted are 2.28 billion ETB or 1.85% of total initial contract amount of the projects. The other and the critical cause of cost overrun is cost of price adjustment related to price escalation of major construction materials, equipment's and exchange rate. Which caused increment of cost in monthly base and in previous 5 years ERA spent on average 68% of additional cost for price adjustment related to price escalation of the aforementioned items. Related to the above data the study identified and summarized the top critical causes of time overrun, cost overrun, quality problems & Scope change. In addition, based on the findings the researcher forwarded his recommendation for subsequent improvement.

Key words: Road Construction Project, Local Contractors, Project time management, Cost management, Quality management & Scope management

CHAPTER ONE

1. INTRODUCTION

The development of comprehensive road infrastructure serves as a fundamental element in achieving sustainable and expansive progress. The significance of road transport for the acceleration of socio-economic development in Ethiopia is emphasized within the context of its geographical features, settlement patterns, and economic activity. The provision of enhanced roadway infrastructure facilitates the development of both agricultural and non-agricultural pursuits, thereby catalyzing progress across all sectors of the economy. The government of Ethiopia places significant dependence on its road infrastructure in order to facilitate its public transportation systems.

The establishment of construction industry presents considerable potential for extensive employment opportunities, creates a market for providers of construction inputs and services, and the services offered also serve as inputs for various other sectors. The construction industry provides significant amounts of fixed investment, contributes considerably to national output and is a major source of employment, directly and indirectly through its multiplier effect (Walker and Flanagan, 1991). In this regard, in most countries, construction constitutes more than half of capital investment, contributes up to 10% of GDP and accounts for almost 28% of all industrial employment (Winch, 2002; CSIR, 2003). As (Idoko, 2008) noted, “many projects in developing countries encounter considerable time and cost overruns, fail to realize their intended benefit or even totally terminated and abandoned before or after their completion” Furthermore, the development of the construction sector in developing countries typically falls significantly behind that of other industries present in those nations and in comparison, to their equivalents in developed countries. Generally, as [(Ofori, 2006) & (Jekale, 2004)] concluded, “The construction industry in developing countries failed to meet expectations

The Ethiopian construction sector, like many other developing countries, has numerous problems and obstacles that are similar to those faced by other developing sectors. It is possible that nations may implement more rigorous measures. The construction industry plays a pivotal role in modern societies, encapsulating the vital function of building infrastructure and catalyzing economic growth across various sectors. In order to help the industry in those nations enhance its

effectiveness, it is essential to prioritize efforts towards improving its performance. In the construction industry, contractors hold a significant position as key stakeholders responsible for the creation and implementation of building projects. In order to attain the end product, any endeavors towards the advancement and enhancement of the industry must be undertaken.

The private sector is using its capital to purchase a variety of fixed assets, including new machinery and equipment, new buildings being built, and building maintenance tasks. Ethiopia's construction industry has made significant contributions to reducing poverty, expanding employment through the growth of small and medium-sized businesses, and creating jobs. For effective construction industry development to establish effective project management system has play a crucial role for competitive advantage of construction firms. Improving the contractor's project management capability can significantly contribute to the overall improvement of contractor's capacity to deliver successful projects. Any project's success is determined by how quickly it is completed, how much it costs, and how well it performs in accordance with the original design.

Organizations are increasingly using project management tactics to plan and organize resources to achieve a specified outcome within a given timeframe and a constrained budget (Singh, 2019). Companies that use project management do work better by using resources efficiently, completing projects faster, spending less money, and having workers cooperate with each other. This makes the company better as a whole, and it also helps the company achieve better results and quality work. (Singh, 2019). The cornerstones of successful project management include excellence in effective project management, which can also ensure measurable and tangible results based on scope, time, and cost. (Kerzner, 2017). Therefore, the goal of this study is to evaluate how project management is actually used in Ethiopian road construction projects and to identify major factors that affect the effective undertaking of project management practices in construction industry.

1.1. Statement of the problem

The massive infrastructure expansion of the nation and the impressive construction activities in major centers has given researchers a chance to examine the construction industry and its implementers. Road infrastructure is one of the significant components of construction and has great contribution to attain sustainable development of the country economy. Road mobility is crucial for driving socioeconomic growth in Ethiopia given its geographic characteristics, habitation patterns, and economic activities. Access to a better road system fosters the promotion of both agricultural and non-agricultural industries and encourages the expansion of all economic sectors. Ethiopia heavily depends on its road system to provide public transport.

Ethiopia's government is spending vast sums of money in several mega projects to boost public service quality. However, failure to meet the construction planned timeline, estimated cost, and necessary quality is a very common problem that affects almost all infrastructure projects. The majority of Ethiopian projects, including Irrigation dams, sugar mills, fertilizer facilities, and road and rail developments, integrated housing development and electrical megaprojects, have failed to meet their objectives.

MoWUD, (2006) the Ministry of Urban Development and Construction stated that the local and international quality standards, as well as the sector's output expectations, are not being met by the Ethiopian construction industry. From the beginning to the end of a construction project, there are specific procedures and challenges that must be overcome. Among the issues were time and cost overruns (2013) Hussin et al. Time, cost, quality, client satisfaction, productivity, and safety are just a few of the concerns and problems that the industry must deal with (Biyadgligh, 2017).

According to Oluwajana, S.M. 1, Ukoje, J.E. 2, Okosun, S.E. 3 and Aje, I. O. 4 2022 the common *Factors Affecting Time and Cost Performance of Road Construction Projects in Nigeria* that shows inadequate equipment, inadequate managerial skills, project construction complexity, equipment failure and a lack of materials are the crucial elements affecting the timely completion/performance of road construction projects in Nigeria. Inflation, inaccurate estimates, dishonest business practices, contractors' lack of project experience, poor planning, and overdesign were other key factors linked to how much road construction projects cost. The

success of a project's execution is measured in terms of time, cost, and quality. (Majid I, 2006, African Economic Outlook, 2018). Delay and cost inflation are two of the most common problems encountered during the construction of infrastructure projects, especially road constructions. (Mahamid, et al., 2012). Kesto, D. A., & Tsega, B. (2022) as noted in their finding, the domestic contractors are far from being competitive in terms of cost overrun, time overrun and quality performance,

Based on the finding from various literatures, the practice of construction project management in Ethiopia found at low level of practice. In this regard the assessment of problem is to identify the challenges related to current project management practice & to identify the reasons that causing significant effect on project delay, cost overrun, quality problems sometimes project failure and scope change.

1.2. Research Question

In relation to the objective of this research, the study addresses the following research questions in Ethiopian road construction projects:

- ✓ What is the level of project time management practice, time overrun & major reason for time overrun?
- ✓ What is the level of project cost management practice, cost overrun & major reason for cost overrun?
- ✓ What is the level of project quality management practice, quality problem & major reason for quality problem?
- ✓ What is the level of project scope management practice, scope change & major reason for scope change?

1.3. Objective of the Study

1.4.1. General Objective

The objective of this study is to assess and identify the level of project management practice & to identify causes for in effective project management practice in terms of Time, Cost, Quality & Scope management.

1.4.2. Specific Objectives

Based on the study's overall goal and the aforementioned research questions, this study considered the subsequent specific objectives;

- To identify the level of time management, time overrun and causes of time overrun.
- To identify the level of cost management, cost overrun and causes of cost overrun.
- To identify the level of quality management, project quality problem and causes of poor quality.
- To identify the level of scope management, scope change and causes of scope change.

1.4. Significance of the Study

This study required to evaluate the effectiveness of current project management practices by domestic contractors in Ethiopian road construction projects in terms of time, cost, quality & scope management. The main emphasis of the assessment is to evaluate and identify the reason behind cost overrun, time overrun, quality problem and scope change. Because, these three constraints are the pillar of project management and scope management is highly dependent on these constraints, the others are directly and indirectly related to these constraints. Also, this study is mainly to identify the critical problems that influence the project management. Which are based on the actual situation of the project and the findings that identified in previous literatures. To identify the problems, analyze and recommend better way of solution will help the contractors to develop effective management among, time management, cost control methods, quality assurance, scope management. Also, it aids to develop better communication and coordination among functional departments, and effective site management. Even though, the Project management is mainly controlling and owning by project manager, All the participants that is Project management senior staffs, Project team members, Supervisor, client, the functional management members, other concerning bodies and all stakeholders can play big role in the system of project management, hence the project management is to be taken as a team work and each member should use their maximum effort that the project management to be as effective as needed.

1.5. Scope of the study

The study includes only Domestic Contractors those working in Road Construction Projects & the projects those owned by and run under Ethiopian Road Administration/Authority. The selected projects are ongoing road construction projects & completed in previous five years period of time from 2018 - 2022. It is only concerned in projects with a total investment of more than 200 million birr/local currency. Even if the topic entitled the construction project management practice which including ten knowledge areas, this study addressed or focused only on four areas of knowledge, which are Project time management, cost management, quality management & scope management.

1.6. Limitation of the Study

The study address only with domestic contractors engaged in the road sector and as such cannot wholly represent the overall construction industry. And it was also difficult to obtain an ordered and conveniently accessible data set during data gathering. Secondary data that had been handled by a central department of construction companies, despite the fact that the cost overruns of road construction project in the agency were secret for stakeholders and public views. Poor data collecting and reporting system by firms are one of the challenges to get the reliable and complete secondary data of the project. Insufficient public exposure of project history and inadequate data administration systems have been observed to impede the researcher's data collection efforts and time allocation considerably. Although this research is governed by certain limitations, it endeavors to accurately depict patterns and present a comprehensive overview of the industry, drawing from key criteria to the maximum extent feasible.

1.7. Organization of the Study

Chapter One: Introduction: This section called an overview or the background of the study's research topic. The problem statement, the research question, the study's purpose or objective, its significance, scope, and limitations were all discussed in this chapter. Chapter Two: Literature Review In this chapter, an in-depth review of literature related to the primary subjects of the study was conducted by analyzing and synthesizing multiple relevant sources authored by experts in the field. The aim of this review was to provide a comprehensive understanding of the theoretical and empirical foundations of the study. This division's primary focus pertained to Project management process, Project management practice and challenges in project

management. Chapter Three: Methodological Considerations: This section delves into the methodology employed to generate the research outcomes. The current study details the research approach and design, population and samples, as well as the data collection methods utilized to obtain the necessary information. Chapter Four explores the presentation, analysis, and discussion of data. In this chapter, the results derived from the comprehensive data analysis, interpretation, discussions and justification. The findings of the investigation were systematically collated and analyzed using the information gathered from a primary source, different literatures & secondary information from various sources. The findings were subsequently classified based on the area of the project objective. Chapter 5: Summary, Conclusion, and Recommendations: This study's research section offers the outcomes during the analysis, identifies the practice level of project management, factors affecting the construction sector, and forwarded targeted interventions to address the identified constraints, needs, or issues.

CHAPTER TWO

2. LITRATURE REVIEW

This section provides a comprehensive review of prior research endeavors, scholarly analyses, and other significant contributions pertaining to the goals and objectives of the present study. This paper presents an overview encompassing theoretical, empirical and conceptual dimensions, as well as identifies research gaps, derived from a synthesis of extant literature on the topic of Construction Project Management. Moreover, the aforementioned approach serves as a foundation for discerning the deficiencies of contemporary Project Management methodologies against the practical implementation of Project Management by Ethiopian Contractors in the project of road construction. Additionally, this method facilitates the formulation of appropriate research inquiries, diction of research methodology, selection of survey instruments for data acquisition, implementation of data analysis, interpretation of findings, and formulation of conclusions. Ultimately, this paper presents an analysis that outlines the challenges confronting the construction industry, alongside recommendations aimed at addressing the aforementioned challenges in a manner that improves both efficiency and effectiveness. The study concludes by highlighting the findings of the analysis, offering insights into how the industry can remedy its issues, constraints, or needs.

The present theoretical framework provides a concise conceptual basis and a strategic roadmap to facilitate an organization in its pursuit of achieving its goals. The monitoring processes considered to be a fundamental methodology in ensuring effective project implementations, as posited by Kasaija (2015) and Chapman (2014). The optimal management of project implementation necessitates meticulous oversight of the diverse groups and their assigned tasks throughout each stage, thereby enhancing the proficiency and capabilities of the agencies to effectively fulfill their overarching objectives (Muchelule, 2018). Therefore, this theory serves as a foundational framework for the present investigation. Several constraining factors are linked to project planning, production management, project administration, and the assessment of project performance during its execution. The present study incorporates the theory in relation to the challenges faced by road contractors during the implementation of road projects, wherein issues related to capital, management skills, and monitoring practices emerge as prominent constraints.

The most effective approach to resolving the aforementioned issues is to devise a mechanism for mitigating these challenges and eliminating the obstacles associated with the execution of infrastructure projects on roadways.

The level of project management practice in the construction industry is unsatisfactory in terms of the application of common project management processes, functions, tools, and project management techniques. Particularly, the level of practice in terms of safety, risk and time management was found to be very low. The progress lags range from 61-80%, and the amount of planned costs and other variables such as risk, quality, resource usage, and safety deviates between 21-40% of requirements. predefined or expected requirements at the start of the project (Tadesse, et al.,2016)

Maturity assessment of contractors in Ethiopia is undertaken and, low level of PM maturity (Informal practice of the basic processes) is found. The study also discovered that ISO certified contractors had higher PM maturity than non-certified ones. Similar findings show that contractors who participated in the capacity building program had higher PM maturity levels than those who did not. The PM maturity of road contractors is also found to be higher than that of building contractors. A higher maturity level for material, procurement, cost, financial, time, and human resource management was also discovered by the research. The least developed PM areas are found to be risk and safety management. (Yimam.,2011)

Right of way or access issues, changes in the defined scope, improper planning, improper contractor evaluation of the tender documents during the tendering phase, and contractor financial issues were all noted as major contributors to these variations, with the client or employer held more accountable for starting the majority of the variation issues. The study also looked into the following factors as major effects of variations: delay in project completion time, increase in project cost, suspension or hold-up of work, decrease in productivity, and dispute among parties. Contractors were found to be the contracting party most affected by these factors. (Tadesse, 2009)

The top ranked five delay factors found incomplete to study before project approval, poor project management & coordination, the right of way issues, inaccurate forecasting of schedule,

psychological biases, and political interests. Inflation of material cost, the scope change with the change order, incomplete study project approval, poor bill of quantity & design, and poor project performance monitoring among top ranked cost overrun determinants. The correlation between time overrun variables/or determinants, and time & cost overrun determinants directly affecting the other time and cost overrun variables in the same project. (Yenealem F, 2020)

According to (Solomon S. 2015) the phases and core processes ERA employs in its project delivery are comparable to 'accepted practices'. However, there are key deviations from the best practices recommended in the literature in the execution and management of these processes. The major ones are: 1) ERA's approach to project delivery is excessively fragmented; and 2) ERA's project delivery methods and procedures are insufficiently tailored to the unique traits and circumstances of its projects and its environment. 3) The Authority's performance monitoring and evaluation methods are self-serving, and its project quality assurance measures are inadequate; 4) External factors that have a significant impact on the Authority's project delivery include the unstable environment, the inadequate supply chain, the fragmented knowledge base, and careless and lax industry practice.

The key challenges identified within the construction industry are, Lack of adequate standards and guidelines, lack of adequate machinery and tools, weak institutional capacity to oversee the construction industry, lack of construction project management and control skills were just a few of these many issues. These difficulties have contributed to the industry's poor performance level, which is reflected in delivery delays, cost overruns, and low quality. The industry's major players are known to engage in corrupt and unethical behavior, which is a known constraint that results from a lack of implementation capacity. Furthermore, the primary cause of all difficulties was the lack of a clear policy framework for the construction industry. (Hailemeskel T, 2013)

The study by Kesto, D. A., & Tsega, B. (2022) that titled "A Comparative Analysis of the Performance of Domestic and Foreign Contractors: The Case of Ethiopian Federal Road Construction Projects". The study revealed that domestic contractors are far from being competitive in terms of cost overrun, time overrun and quality performance. Ernest K, (2017), revealed in his study of the challenges to the pricing of projects in the Ghanaian construction industry are Poor understanding on costing specialist works, low level of education is more

severe in obstructing the pricing of construction projects in relation to quality related challenges.

According to the study of Wondwossen K. (2013) that titled "*Factors affecting time performance of local road contractors on federal road construction projects*" the study found; financial related problems, improper utilization of advance payment followed by financial constraint for construction material and spare parts have been agreed as very important factors that affect the time performance. Moreover, poor management which is manifested as unrealistic resource allocation in the planning period and poor site coordination of available resource during the construction period was ranked as the preceding factors that affected time performance. Inadequate planning and scheduling, poor project management system by contractor and late possession of site by the client are identified as the most important factors causing poor time and cost performance of local contractors. (Rahel K, 2016).

2.1. Theoretical review

2.1.1. Features of Construction Industry

Constructing a project is no easy feat - it's complex and time-consuming. It usually goes through several phases that need a range of specialized services. You need help from financial organizations, government agencies, engineers, architects, lawyers, insurance companies, contractors, material manufacturers and suppliers, and building tradesmen. Even a small project involves many skills, materials, and hundreds of different operations. Every step must be done in a certain order and all the components fit together - no two jobs are ever the same. Each structure is tailored to the environment, designed to serve its purpose, and reflects the preferences of the people involved. All the variables of the construction site, like topographical and geological conditions, weather, etc., make every project unique. Even if you use factory-made modular units, there's still a lot of individual elements. Many manufacturing processes are moving towards this kind of production and using projects management tools from construction. In general, construction can be categorized into three main sectors: buildings, infrastructure, and industrial projects. The field of construction is typically subdivided into two categories: housing and commercial. Heavy construction or engineering, also known as infrastructure, comprises extensive projects like public works, dams, bridges, highways, railways, water or wastewater management, and utility distribution.

Construction greatly impacts all countries' economies and is integral to nearly all development activities. Infrastructure, schools, hospitals, and neighborhoods are products of construction; this industry plays a significant role in developing countries. In developing countries, construction comprises 80% of capital assets, 10% of GDP, and over 50% of fixed asset investments. (Jekale, 2004) Despite its significant contribution, the construction industry's development and efficiency are relatively low compared to other industries. High project performance and success are uncommon, especially in developing countries. (Long et al, 2004) In most of countries, the construction industry has low productivity and technology use compared to other sectors, with weak management. "The Construction industry uses large amounts of capital but has low profitability and inferior management, particularly in developing countries." The Construction industry in developing countries is fragmented and public sector dominated (Jekale, 2004; Rodwin, 1987; Austen and R, 13). (H. Neale, 1984) mentions a market with government interventions, foreign finance, and dependency on public construction, and low development of indigenous technology. The construction industry in developing countries relies on imported materials, machinery, and skilled labor. Foreign firms dominate the industry and execute major projects, including in Ethiopia.

2.1.2. Road construction development in Ethiopia

From Menelik to the end of the Dergue Period: A Short History of Modern Transportation Development in Ethiopia. When discussing modern transportation in Ethiopia, the reign of Emperor Menelik occupies a crucial position. The 1950s and '60s constitute that period in the history of the development of our country's transportation sector in which much was accomplished. The building and administration of transportation infrastructure was completely under the jurisdiction of the Highway Authority. This centralized transportation service, as well as infrastructure development and administration, continued until 1984/85, a situation that is still fresh in our memory. Profile of the Country's Transportation System from 1984-1997 Structural adjustment in many government institutions was first initiated in 1984. Accordingly, while in 1984 the country's road transportation service became de-centralized, the other branches of the sector have continued to-date with their previous structures intact.

The road network in Ethiopia, as a collective entity, amounted to 6400 km in 1951. Subsequently, the network expanded to 9160 km by 1973, exhibiting a compound annual growth

rate of 2.05%. During the tenure of the Dergu regime between 1974 and 1991, the aggregate length of the road network amounted to 19,017 kilometers, exhibiting a yearly growth rate of 6.2% (Ethiopian Roads Authority, 2009; Worku, 2011). Since the establishment of the Rural Self Development Programme (RSDP), there has been a notable expansion in the scope and scale of road rehabilitation and construction projects throughout the entire country.

Over the past more than two decades, the allocation of resources towards the development of road infrastructure has been widely recognized as a crucial element of the rural development strategies pursued by the Ethiopian government. This public investment in road infrastructure serves as a pillar for advancing rural development objectives in the country. In view of the socio-economic importance of road transportation, the administration commenced a Road Sector Development Program (RSDP) in 1997. The primary objective of the Rural Sector Development Project (RSDP) that entailed rehabilitation, upgrading and expanding road network through the implementation of novel road construction projects nationwide. The Road Sector Development Program (RSDP) was segmented into five distinct phases: (Ethiopian Roads Authority, 2014).

- RSDP I - 1997 to 2002 (5 years plan)
- RSDP II - 2002 to 2007 (5 years plan)
- RSDP III - 2007 to 2010 (3 years plan)
- RSDP IV - 2010 to 2015 (5 years plan)
- RSDPV - 2015 to 2020 (5 years plan)

In this RSDP the road network in the country's shows increment from 26,550 km in 1997 to 144,027 km in 2020 (average growth of 7.5%). As a result, the road developed from 24.1 km in 1997 to 130.9 km in 2020; there were more roads per 1000 square kilometers. Additionally, there has been an improvement in the state of the nation's road system. The proportion of road network (only federal and rural gravel road network) in good condition was 22% in 1997 and in 2020 from the total federal, regional and URRAP road network (which is 120,313 km), 20.1% is in good condition (Ethiopian Roads Authority, 2021).

Table 2.1: Summary of 23 Years Performance of RSDP

Program	Physical Plan Vs. Accomplishment, km			Financial Plan Vs. Disbursement, in million ETB		
	Plan	Actual	% age	Budget	Disb.	% age
RSDP I	8,908	8,709	98	9,812.9	7,284.6	74
RSDP II	8,252	11,589	140	15,985.9	18,112.8	113
RSDP III	14,686	12,395	84	34,643.9	34,957.9	101
RSDP IV	97,517	85,860	88	125,409.1	158,333.3	126
RSDP V	**114,846**	**40,665.4**	**35**	**334,514.4**	**196,050.98**	**59**
Total RSDP (23yrs)	**244,210.1**	**159,218.4**	**65.2**	**520,366.2**	**414,739.67**	**80**

Source: ERA RSDP report (2021)

Figure 2.1&2.2 Physical plan Vs Accomplishment & Financial Plan Vs Disbursement

Source: ERA RSDP report (2021)

2.1.3. Parties and their Roles in Construction Industry

Infrastructure construction companies can be categorized into a diverse range of groups or specialties. Various categories of contractors can be observed in the field of construction, such as general contractors, construction contractors, electro-mechanical service contractors, road contractors, utility contractors, and many others. According to estimates provided by the Ministry responsible for Contractor Registration, there exist a total of 3257 general contractors, 2142 construction contractors, as well as 26 road contractors, in the country of Ethiopia. As the list report in 2016/17 the total registered contractors Out of these are 133 Grade 1, 53 Grade 2, 76 Grade 3, 539 Grade 4, 1246 Grade 5 & 1071 Grade 6 and others.

A number of stakeholders, namely clients, government agencies, expert consultants, financial creditors, subcontractors, and manufacturers, exhibit varying degrees of interest in diverse forms of interaction with construction enterprises. Construction contractors are awarded contracts by clients, while government departments are responsible for issuing relevant regulations. Clients also receive professional services from consultants, and contractors are financially assisted and supported by creditors. Subcontractors, on the other hand, offer partial or specific assistance to contractors in completing construction works, and suppliers provide the necessary materials and equipment for the completion of such works. Cultivating favorable relationships with these stakeholders enables the contractor to attain and enhance the efficacy of construction undertakings. The majority of infrastructure programs are typically governed by a triumvirate of pivotal project members, working collaboratively towards the successful attainment of project objectives. The ternary configuration comprising the Client, Consultant, and Contractors is commonly denoted as the 3Cs. During the year (2002), Chitkara made a significant contribution to the academic literature.

Initiative Participants No matter the nature of the project or the type of construction involved, three key parties must be involved. The Owner, Engineer/Designer, and Contract are these participants. In addition to these key players, there are numerous other supporting players, including suppliers and subcontractors. They are working together under the role of the Project Manager in order to deliver the project's final product.

2.1.4. Project & Project Management.

A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists (Project Management Institute (PMI), 2008). Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management is accomplished through the appropriate application and integration of the 42 logically grouped project management processes comprising the 5 Process Groups. These 5 Process Groups are: Initiating, Planning, Executing, Monitoring and Controlling, and Closing (Project Management Institute (PMI), 2008) According to Turner's (1999) definition, a project is an undertaking that

involves the organization of human, financial, and material resources in a unique way to accomplish a specific scope of work, as defined by particular constraints in cost and time, with the ultimate goal of achieving quantitative and qualitative objectives that result in beneficial change.

Declerck et al. (1983, 1997) provide insight into the political perspective surrounding projects by defining a project as a collection of actions that are time-bound and situated in a politico-socio-economic landscape. This environment serves as a dynamic agent of interaction that is essential to the realization of the project's objective. Moreover, the goal of the project is subject to continuous redefinition through the interaction process between the projected plan and the empirical reality.

Undertaking a project implies the allocation of financial resources with the anticipation of beneficial outcomes, and thus should exhibit a logical capacity for planning, financial management, and execution in its entirety. The defined undertaking possesses explicit parameters marking its commencement and cessation and endeavors to accomplish a well-defined set of objectives. A distinguishing feature of an investment is its propensity to deviate from prior similar investments and to remain dissimilar from subsequent investments. This characteristic marks an investment as an exceptional undertaking, rather than a routine component of longstanding initiatives. This project will possess a well-defined succession of production and investment endeavors, along with a specific array of benefits that can be designated, quantified, and oftentimes, assigned a monetary worth. It is often observed that a project is commonly supported by a specifically crafted monetary bundle and is accompanied with an administrative framework and a set of accounts that are partially or fully autonomous.

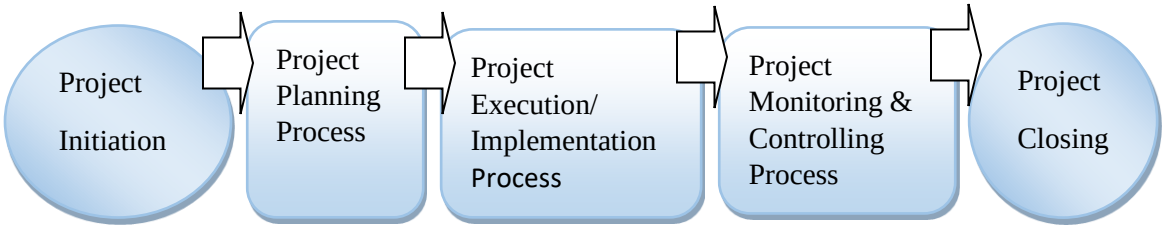
Nilsson and Soderholm (2005) posit that project planning and plans are essential components of effective project management. The objective of plans is to systematize and guide the efforts of project team members, as they strive to attain any established project objectives. Nevertheless, it is imperative to acknowledge that there exists a restricted level of intricacy that a strategy can attain. Upon review of daily project management methods, it appears that plans tend to disintegrate and lose their specificity.

2.1.5. Project Management process

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. It requires the effective management of appropriate processes, which must take into account organizational process assets and enterprise environmental factors. The process of project management is considered to be vital for the successful execution of any project. The principal for inter-connecting all project-related activities and processes stems from the centrality of project management as the fundamental process in project management. The PMBOK Guide delineates the comprehensive process of project management into five distinct stages, known as "process groups": Initiating, Planning, Executing, Monitoring and Controlling, and Closing.

To be successful, the project team must select appropriate processes, use a defined approach, comply with requirements, and balance competing demands of scope, time, cost, quality, resources, and risk. Project management processes and product-oriented processes overlap and interact throughout the life of a project. Good practice refers to the widespread acceptance that using project management techniques has been shown to increase the likelihood that a variety of projects will succeed. The project manager is in charge of selecting the appropriate processes and level of accuracy for each process of any given project.

Figure 2.3 Project management process groups



Source: PMI 2008

- **Initiating**: During the initial phase of the project management process, the project undergoes conceptualization, wherein the feasibility of the project is assessed. The Initiating Process Group consists of processes to define a new project or a new phase of an existing project by obtaining authorization to start it. This includes defining the scope and financial resources, identifying stakeholders, and selecting a project manager. This information is captured in the project charter and stakeholder register, and when the project charter is approved, the project becomes officially authorized. Initiating processes may be performed by organizational, program, or portfolio processes external to the project's scope of control. The project manager is given the authority to

apply organizational resources to subsequent project activities.

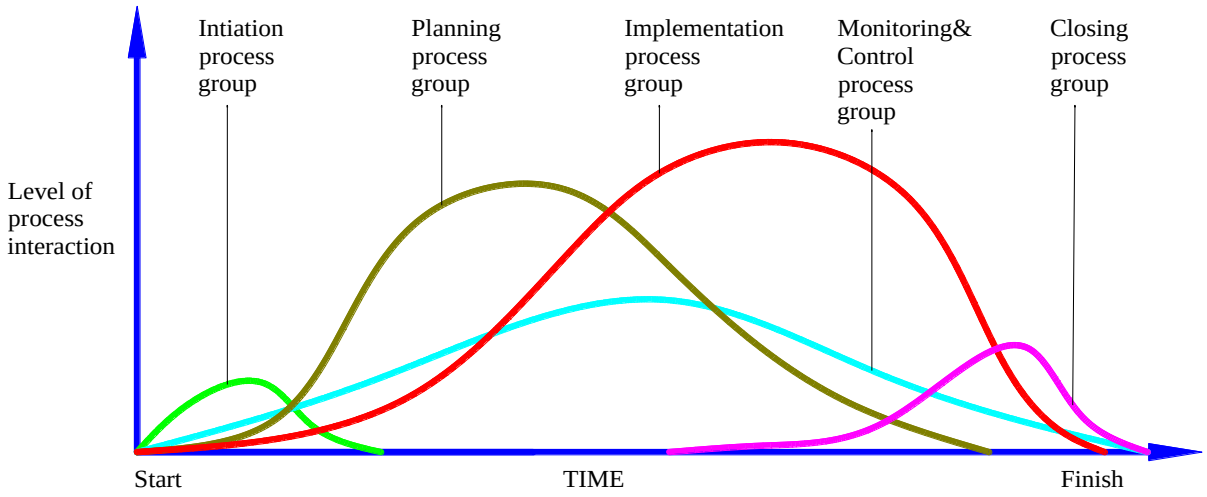
- **Planning**: The Planning Process Group consists of processes to establish the scope of the effort, define and refine objectives, and develop the project management plan and project documents. This process is often called "rolling wave planning" and is iterative and ongoing. The project management plan and project documents will explore all aspects of the scope, time, costs, quality, communication, risk, and procurements. The project team should encourage involvement from all stakeholders when planning the project and developing the project management plan and project documents. Procedures set by the organization dictate when the initial planning effort ends. The results of iterations are documented as updates to the project management plan or project documents.

  Lack of proper planning is one of a challenge factor that inhibits the effective accomplishment of projects (Stephen, 2018). Poor planning leaves no clear pathway for how the project will be carried out. Therefore, employers and team members at certain points of the projects do not have a clear direction as what to do, when and how (Stephen, 2018). An effective means of learning from experience that combines explicit and tacit knowledge to the continuous improvement of project management processes and practices is one of a success factor Davies (2002).

- **Executing/Implementing**: During this particular phase, the project manager shall undertake the essential procurement processes necessary for the implementation of the project and proceed with staffing the relevant team members). The successful attainment of the project's objectives hinges on the proficient administration of the personnel operating on site. Project managers (PMs) are accountable for allocating tasks and supervising project work, while concurrently sustaining positive relationships with all team members and ensuring that the project is executed within the designated schedule and budget. This necessitates that the Project Manager must possess exemplary leadership qualities and demonstrates a high degree of organization. This is due to the necessity of attending to team-related concerns and issues that may arise during the course of the project, which will entail frequent and transparent communication with all relevant team members and stakeholders. Regarding task implementation, every member of the team undertakes their respective assignments within the specified timeframe for each activity. The comprehensive timetable for the project shall serve as a means for evaluation the advancement of the project progress.

- **Monitoring and control**: In the course of this undertaking, project managers will vigilantly assess the progress of the project to ascertain that it is evolving satisfactorily. Documentation, including data collection and oral as well as written status reports, shall report daily, weekly, monthly and as required the course of the project life cycle. The concepts of monitoring and controlling are intricately associated with project planning in academic discourse. According to the SME Toolkit, planning outlines the objectives to be achieved, whereas monitoring and controlling ascertain the degree of effectiveness with which those objectives have been fulfilled. The process of monitoring will proactively identify any indispensable corrective measures or alterations in the project, in order to maintain its progression on course. If the monitoring and evaluation objectives are not quantifiable, they cannot be used to assess project performance and accomplishments or to share project results. (Tengan and Aigbavboa, 2016).
- **Closing**: The closure phase of a project occurs subsequent to the successful development of project deliverables, and subsequent validation and approval by relevant stakeholders. During this phase, the individual in charge of overseeing the project will undertake the process of contract closure with various external entities, such as suppliers, vendors, consultants, and other third-party providers. In order to maintain a comprehensive record of the project, all pertinent documentation will be duly archived. Additionally, a conclusive final project report will be generated for comprehensive documentation of the project's objectives, methodologies, and outcomes. Moreover, the conclusive segment of the project maintenance plan for the purpose of addressing issues and upholding system functionality comes into effect.

Figure 2.4 Process groups interact in a phase or project



Source: PMI 2008

2.1.6. Project Management

The PMBOK® Guide describes the project management processes, tools, and techniques used to manage a project toward a successful outcome The foundation for the creation of the Project Management Body of Knowledge (PMBOK) restricted from the need for a harmonized and systematized framework for the various sides of project management.

The Project Management Institute (PMI) has classified the extensive field of project management into ten more manageable areas. Termed as the 10 project management knowledge areas, these areas are elaborately explained in the Project Management Body of Knowledge (PMBOK) guide. The knowledge areas associated with project management are concomitant with the process groups, which encompass project initiation, project planning, project execution, monitoring and controlling, and project closing. The aforementioned are the orderly, sequential stages that are inherent in the progression of any given project. The knowledge areas are implemented within any of the various process groups. The knowledge domains are fundamental technical themes that are indispensable for efficient project management.

The study entitled "*Assessment on Performance and Challenges of Ethiopian Construction Industry*" by (Tadesse, et al.,2016), The level of construction project management practice in terms of adapting general project management procedures, project management functions, tools

& techniques to be unsatisfactory. Particularly, the level of practice in terms of safety, risk and time management was found to be very low. The amount of schedule slippage ranges between 61-80% and that of planed costs and other variables such as risk, quality, resources utilization and safety deviates in the range 21-40% from predetermined requirements or anticipated at the beginning of the project

The other study entitled "*Project Management Maturity in the Construction Industry of Developing Countries*" by (Yimam.,2011) maturity assessment of contractors in Ethiopia is undertaken and, low level of PM maturity (Informal practice of the basic processes) is found. Further, the research found ISO certified contractors‟ PM maturity to be higher than those which are not. Similarly, the PM maturity of contractors which took part in Capacity Building Program is found to be higher than those which did not take part. Likewise, Road contractors PM maturity is found to be higher than Building contractors. Moreover, the research found higher maturity level for material, procurement, cost, financial, time, and human resource management. Risk and safety management are found to be the least matured PM areas.

Table 2.2: Project Management Process Groups and Knowledge Areas Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	**Planning Process Group**	**Executing Process Group**	**Monitoring & Controlling Process Group**	**Closing Process Group**
Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Project Work, Perform Integrated Change Control	Close Project or Phase
Project Scope Management		Collect Requirements Define Scope Create WBS		Verify Scope Control Scope	
Project Time Management		Define activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule		Control schedule	
Project Cost Management		Estimate Costs Determine Budget		Control Costs	
Project Quality Management		Plan Quality	Perform Quality Assurance	Perform Quality Control	
Project Human Resource Management		Develop Human Resource Plan	Acquire Project Team Develop Project Team Manage Project Team		
Project Communications Management		Plan Communications	Distribute Information	Report Performance	
Project Risk Management		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses		Monitor and Control Risks	
Project Procurement Management		Plan Procurements	Conduct Procurements	Administer Procurements	Close Procurements
Project Stakeholder Management	Identify Stakeholders		Manage Stakeholder Expectations		

Source: PMI 2008

Project Integration Management includes the processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups (PMI, 2008). Generally, the above all project management knowledge areas are necessary and has big role in effectiveness project management and successful implementation of project. When we success of any projects, it is measure with no or less scope change, timely completion, within budget, keep quality of

deliverables and customer satisfaction. In this regard to attain the objective of project management, it is critical to manage these four knowledge areas of project management. All the remaining project management knowledge areas are directly and indirectly related project Scope, time, cost & quality. In addition, each of these constraints are highly interrelated and the change in one of them will cause significant change to others.

2.1.6.1. Project Time Management

Project time management consists of the processes required to manage the timely completion of the project (PMI, 2008). Project time management pertains to the careful examination and establishment of a refined plan and chronology for the successful attainment of a project. This project is subdivided into separate tasks, each of which is correlated with specific start dates and deadlines, alongside allocated budgets. Throughout the various phases of a project, there is a continual state of change necessitating the frequent revision of various aspects.

The aforementioned process entails plan schedule management, which entails devising a comprehensive schedule for the project and identifying the respective tasks assigned to individuals. This implies the need to delineate distinct undertakings, which should not be misunderstood as equivalent to generating a Work Breakdown Structure (WBS); although, they share some commonalities. In order to effectively manage a project, it is necessary to develop a comprehensive task list encompassing all relevant aspects.

Subsequently, these assigned duties are arranged in a logical sequence whilst taking into account any interdependent relationships amongst them. Such dependencies are duly recorded for effective task management. The aforementioned interdependencies are identified and classified as belonging to one of the four categories: finish-to-start (FS), finish-to-finish (FF), start-to-start (SS), or start-to-finish (SF). This primarily concerns projects of substantial magnitude.

Having established the sequence of tasks, it is integral to proceed with estimates and allocations of the requisite resources for each task. At this juncture, the length of each undertaking is ascertained. This process will end in the formulation of a schedule, which involves the initial determination of the critical path and float durations of each task. An efficacious approach for scheduling tasks is to employ a Gantt chart as a tool for plotting the timeline of the activities. Subsequently, in order to equilibrate the deployment of resources, it is advisable to methodically engage in resource leveling activities. After the initial preparation of the schedule, it becomes

imperative to devise a plan to efficiently manage and regulate its implementation. Earned Value Management (EVM) is routinely employed with the aim of verifying that the current project plan is progressing in line with the schedule that was initially formulated.

Inadequate planning by project managers and contractors, poor site management by contractors, a lack of project management experience, and client payment delays to contractors are additional factors that cause schedule delays (Ikediashi, et al., 2014). The predominant causes of delay are design changes, poor labour productivity and inadequate planning (Peter F. Kaming, et al., 2010). According to Daniel W.C. & Mohan M.K. (1997) The Five principal and common causes of delays are: ‘poor site management and supervision’, ‘unforeseen ground conditions’, ‘low speed of decision making involving all project teams’, ‘client-initiated variations’ and ‘necessary variations of works.

2.1.6.2. Project Cost Management

According to PMBOK® Guide – Sixth Edition, the objective of Project Cost Management is to execute a series of processes, which entail careful planning, estimating, budgeting, financing, funding, managing, and controlling costs, in order to ensure that the project is executed while maintaining the approved budgetary constraints.

This domain pertains to the project budget and necessitates the utilization of reliable estimation tools to guarantee that resources adequately support the scope of the project. Moreover, Continuous monitoring of allocated funds is essential to keep stakeholders or sponsors apprised of the project's financial standing.

The plan cost management process is designed to ascertain the appropriate approach to formulating the budget, encompassing the determination of the requisite modifications and the utilization of measures to regulate it. Every assignment must undergo a cost estimation process, wherein all essential resources required accomplishing the task, including labor, materials, and equipment, are factored in.

The determination of the project budget is contingent upon the incorporation of expenses associated with each task. Subsequently, it becomes imperative to regulate these expenses via the implementation of an earned value analysis. This process is routinely carried out throughout the duration of the project to ensure that the projected expenses are aligned with the authentic disbursements. Ernest Kissi1 et al. (2016) in their study concluded that the barriers to the practice

of effective cost planning in construction industry are weak cost planning and knowledge base, poor cost databases and understanding, inadequate designs and planning, External conditions.

Dr.K. Divakar et al. (2018) The critical factors affecting effective implementation of cost management process from the study are; Poor scope definition, Inaccurate activity cost estimate, Poor WBS definition, change in schedule, Unrealistic time schedule imposed in contract, Ineffective frequency of project budget updates, Lack of proper training and experience of project manager, Not implementing project management tools like primavera p6 for monitoring and control. Inflationary increases in material cost, inaccurate material estimating and project complexity are the main causes of cost overruns (Peter F. Kaming, et al., 2010).

2.1.6.3. Project Quality Management

Project quality management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken (PMI, 2008).

The successful completion of a project is not solely determined by its timely delivery and adherence to budget constraints, as the attainment of a predetermined standard of quality is equally crucial. Failure to satisfy this requisite renders the project an overall failure. The process of planning for quality management is an integral component of the comprehensive project management plan. It is noteworthy, however, that if the plan incorporates the quality requirements for the product or service, it can serve as an autonomous document.

In order to ensure the adherence to quality standards, the process must imply the inclusion of quality assurance measures. In order to ensure quality control, it is imperative to conduct inspections on the deliverables to verify compliance with the standards specified in the quality management plan.

The significance of quality in the efficacious execution of construction projects cannot be overstated. The enhancement of construction project quality is interrelated with the implementation of quality control throughout life cycle of the project. Whilst quality management throughout all stages of a project's lifecycle is deemed imperative, it is noteworthy that quality management during the execution (construction) phase holds paramount importance towards the ultimate quality outcome of construction projects. This project aims to investigate the significance of quality management in the execution (construction) phase and explore the factors that have an impact on its implementation.

D.Ashokkumar (2014) I his study of Quality Management in Construction industry revealed that the major factors that affect the quality of construction are financial payment, communication, labour and wage, weather, building plan and construction detail, material and equipment, time, and construction methodology. Financial payment is the main factor, communication is important, labour and wage are important, weather is important, building plan and construction detail are important, material and equipment are important, time is important, and construction methodology is important. The most important details in this text are that ISO 9001 registered companies have more concern for their employees' training than non-registered companies, and that lack of co-ordination among departments is important for project success. Other limitations such as cooperation between each party related to the construction project are also discussed. D.Ashokkumar (2014)

2.1.6.4. Project Scope Management

The term "scope" refers to the limitations and parameters of the project work. Thus, this comprises plan scope management, which constitutes an integral component of the overarching project management plan. Additionally, it pertains to the point in the project lifecycle wherein a comprehensive specification for the ultimate deliverable or provision is gathered.

Project scope management is a main function in project management process. Moreover, it is a critical function because any changes or modifications in scope will cause extra cost on the total project development expenses. In addition, scope management ensures the successful management of other key project management areas, including time, cost, and quality. There are six main steps in scope management process namely; plan the scope, collect the requirements, define the scope, create work breakdown structure (WBS), validate scope and control the scope. Qais Hashil Salim Al-Rubaiei Et.al; (2018)

The process of validating scope during a project relates to verifying on a periodic basis that the deliverables are being authorized by the sponsor or stakeholder. This activity holds significance in ensuring the project stays aligned with its objectives and meets the expectations of the pertinent parties involved.

There are three major components in scope management. These include establishing the scope, managing scope change, and verifying scope. Low Sui Pheng (2018). It is anticipated that the scope statement may undergo modifications during the project's duration to regulate the extent of deliverables, particularly in instances of project delays.

Mirza, Pourzolfagha and Shahnazari (2013) Lack of understanding or defining project and product scope at the outset of the project significantly contributes to unsuccessful projects. The implementation of a well-defined and effectively managed scope is conducive to the production of a high-quality deliverable that satisfies the requirements of stakeholders regarding cost and project timeline. Mirza et al. (2013) The work necessary to produce the project deliverables is covered by the project scope. The present project is delimited to the specific tasks and duties that are necessary to achieve the predetermined project goals. The product scope pertains to the distinctive features and qualities of the project outputs. The evaluation of product scope is based upon the fulfillment of predetermined requirements, whereas the assessment of project scope is grounded in conformity to the project plan.

2.1.7. Project Time, Cost, Quality & Scope Management and their relation

One of the most significant challenges encountered by project managers is the need to effectively balance project cost, time, and quality in project management. Attaining this objective presents a difficult challenge due to the interrelated nature of cost, time, and quality, wherein altering one invariably impacts the other two. Project managers endeavor to maintain equilibrium between these three factors when striving to accomplish project objectives, however, they may resort to rendering concessions among these elements during the implementation phase of the project to ensure successful project completion and good customer satisfaction. Each project is characterized by a predetermined level of expected quality for the final outcomes or deliverables. The anticipated level of quality is largely contingent upon the specific requirements and parameters articulated by the client. A project can be defined as a singular undertaking that is delimited by the constraints of time, cost, and quality. The achievement of its objectives is contingent on the proficient reconciliation of these constraints. Project managers frequently attempt to optimize the quality of projects within pre-established temporal and fiscal constraints.

The Iron Triangle was originally conceived as a framework to enable project managers to evaluate and balance the competing demands of Cost, Time and Quality within their projects (Atkinson, 1999). Subsequently it has become the method to define and measure project success, with the general perception amongst project managers that a successful project is based upon these three criteria alone (Shenhar and Dvir, 2007; Duggal, 2011). Any attempt to deviate from, or supplement the three criteria that make up the Iron Triangle is often considered a problem that

must be either corrected or prevented in the first place (Shenhar and Dvir, 2007; Turner and Bredillet, 2009).

Figure 2.5 The traditional iron triangle

The Iron Triangle, a well-recognized benchmark of success indicators in project management, is characterized by cost, time, and quality as pivotal factors in determining project success. However, projects that are delivered on time, within budget and meet scope specifications may not necessarily perceived to be successful by key stakeholders Shenhar.et.al. (2007). The project manager is requested to define, establish and maintain a trade-off among interrelated constraints of heterogeneous nature (Kerzner, 2009). The “iron triangle” is a popular metaphor which identifies quite well the integrative role of the project manager (Atkinson, 1999), (Bernroider, Ivanov, 2011), (Toor, Ongulana, 2010).

The fluctuation in intensity is necessary, yet the triangulation of the three aspects remains constant. Communication is an ongoing aspect of various domains, wherein individuals are persistently engaged in interaction and are required to adapt and modify their approaches accordingly. The focus of this study pertains to the concept of iron triangle denotes a significant interdependence. Enhancing the standard of a particular product or service can lead to a proportional increase in the duration of time required for its completion or implementation. "Requirement for additional resources is imperative, as it is anticipated to result in a corresponding improvement."

Project time management includes processes required to manage timely completion of the project. Project time management involves Preparing work break down, sequencing each activity and developing schedule, subsequently to determine critical path and to prioritize activities on

critical path. Also, to implement each work as per the scheduled time, properly monitoring and controlling the progress of the project. Schedules depend on deadlines, customer demands, logic, prediction, sequential order, and activity dependency, resource availability, working time and days, the weather condition. Time management is crucial for success and budgeting. Define implementation time for each task to determine project time. In planning to identifies tasks, duration, resources, and order to create the schedule. Prioritize quality or cost when time is limited. Based on deep relation between time, cost & quality, the action taken to enhance the time performance will increase the cost of project and may affect the quality of the project. For example, the non-logical time speeding will affect the curing time and sequential order of like concrete construction activity. In relation it will affect directly the quality of the project also when we try to fasten the project, then simultaneously the resource requirement will increase that will cause the cost increment. The project manager is requested to define, establish and maintain a trade-off among interrelated constraints of heterogeneous nature (Kerzner, 2009). The “iron triangle”, is a popular figure which identifies quite well the integrative role of the project manager (Atkinson, 1999), (Bernroider, Ivanov, 2011), (Toor, Ongulana, 2010).

Project Cost Management; Project cost management contains cost estimating, preparing budget, and controlling expenses to assure the project can be completed within the planned budget. Quality improvement is vital for effectiveness of every organization, but it is not easy and tough to achieve cost minimization and quality improvement in the simultaneously, because of high relationship between quality and costs. For example, to deliver good quality product, it is necessary to allocate adequate amount of budget to provide all the relevant resource.

The cost of quality is sourced from failure, prevention and appraisal. Failure costs may be internal or external. Scrap and rework are internal failures with costs exceeding lost product and extra work. In order to determine total costs, include disposal, storage, transportation, and inventory expenses. External failures may lead to repair costs and product recalls after delivery to the customer. Good planning early can prevent later costs and increase profits. Checking incoming supplies affects product quality. Prevention and appraisal lead to improved products, processes, workers, and customer satisfaction. In contrast, failure costs are ongoing reactions. Prevention and appraisal costs bring cost benefits over time.

The Project Quality Management; the Project Management Institute defines quality as the degree to which a set of inherent characteristics fulfills requirements. Quality management includes processes and activities to determine quality policies, objectives and responsibilities. Once a project is completed, quality or performance becomes key issues. To plan for quality, the project manager and team must identify the requirements of planning, determine how they may be met, and identify costs and time demands. The project contractor prioritizes the availability of the outcome in the longer-term perspective, as it must be profitable & acceptable quality. Quality checks must be performed immediately after the completion of each activity, and corrective actions can be taken if the quality is not acceptable. Some of the major benefits of quality in projects are;

- Customer satisfaction - quality project and product will increase customer satisfaction.
- Cost reduction - quality work on project activities can reduce waste and avoid rework which directly leads to the cost reduction.
- Productivity increasing - when decrease defective work the product failure and rework will reduce simultaneously, these avoid the cost incurring for rework and avoid usage of extra time.

2.1.8. Project Management Success Factors

As believed that the most common factors that makes the project successful are; Quality deliverables, Customer satisfaction, being on time, minimizing changes or within scope, being on budget. Project success requires delivering the product within scope, time, cost, and quality. Good project management requires controlling uncertainty, maintaining communication channels, and more. Scope, time, cost, and quality establish constraints for the project manager, who must manage diverse elements within limited freedom. Then (Morris, Pinto, 2004), project success extents in a continuum in which project management success (was the project done right?) is complemented with project success (was the right project done?), to project portfolio management success (were the right projects done, time after time?).

The success of a project is the result of many different decisions, people, tasks, communications, and unseen elements that affect the work of everyone involved. Understanding the most common factors in project success, the acquisition of advanced knowledge pertaining to project

management entails a comprehensive study of the components that constitute successful project management, including but not limited to project planning, effective communication, risk management, and efficient project closure. The project's success is largely dependent on the effectiveness of project management in numerous crucial aspects. Before beginning a project, spend some time in-depth planning; specify your performance goals; reach agreement on what a finished project will look like; and finalize your plan with your clients. Even the best project management success factors would be ineffective without effective communication. Leave the buzzwords behind and offer your clients workable solutions that have measurable benchmarks, performance goals, and a direct path to success for the services and products your project will produce. Teams that work together develop better plans and are more committed to the success of the project. The method of collaborative project management enables all team members to participate completely and make significant contributions to the accomplishment of the project's goals. The extended team (project manager, team members, senior executives, customers, etc.) must stay informed about the project's progress in order to reach the best project outcome. Even though it might seem straightforward, successful planning is an essential element of project management success that shouldn't be overlooked. Effective project planning requires a complete project proposal, a realistic timetable, cost estimates, milestone determination, documentation of deliverables, and project scope. As a project manager to inform your team, foster open communication, and encourage team members to voice any ideas or concerns. Everyone on the team benefits from effective communication between team leaders and team members.

2.1.9. Factors Affecting Project Performance

The obstacles that impede the execution of project management in public organizations in underdeveloped nations were identified as a deficiency in project management knowledge, transfer of authority, inadequate leadership commitment, fraudulent practices, insufficient professional training opportunities in project management, and a stringent organizational structure. These obstructions were identified as inadequate communication, undefined project mission, lack of management support, absence of a scheduled plan for the project, non-participation of clients, suboptimal personnel selection, inadequate technical proficiency, insufficient monitoring and feedback system, and suboptimal conflict management.

PMI (2008) recommended the implementation of an open and efficient communication network as a means of attaining optimal team performance amongst project team associates. According to

Iman and Siew (2008), a project is deemed unsuccessful when it fulfills certain requirements, namely time and budget, yet does not effectively meet the needs or expectations of the client. According to Love (2002), there exists a client-driven tendency for the expeditious completion of designs and contracts, which may exert a potential adverse effect on the quality of the documents produced. In a case study conducted in Nigeria, Ogunde and colleagues (2017) identified a range of obstacles that present difficulties in the practice of project management. The study has identified several key challenges, including the limited involvement of the project manager in crucial decision-making processes, a lack of active client participation in critical project-related decisions, and the utilization of inferior quality materials in project implementation. There are numerous factors that exert an influence on the feasibility of implementing an application, with some of these factors having the potential to contribute to either the eventual success or failure of the project in question. The present study discusses uncertainty pertaining to the execution trajectory, work obligations, and project status. In a general sense, the fundamental factor for achieving success in one's projects and business is through diligent management and the implementation of a healthy project closing mechanism.

Among to different literatures and observation in practical application of project management in road construction projects there have many challenges that affecting the performance of the project. All of these are directly and indirectly related to the management process at each level and knowledge area of project management. Finally, these all variables have direct and indirect impact on Project Time, Cost & Quality. These challenges are;

Time related challenges; Delayed handover of project by client to contractor, Delayed commencement of the project by contractor, Lack of proper plan and schedule by contractor, Delay RoW obstruction and compensation payment by the Client, Effect of Social, Cultural and religious related non-working days, Delay in approval of site works and interim payment certificates by the consultant, Financial problems (delayed payments for completed work, financial difficulties), Unrealistic contract duration and requirements imposed on the contract, Late design review, Unforeseen weather condition, Delay in design documents preparation drawing & data approval by consultant, Delay decision making process by client pending issues related to contract and others, Poor project management ,in planning monitoring and evaluation of the works periodically & Contractors difficulties in financing the project during construction, Shortage of labour, Delay in mobilization of construction Equipment's by the contractor,

Shortage of construction machinery at project, Shortage of spare parts and extended breakdown time of equipment's, Delay in supply of construction material by the contractor, Shortage of Construction material in the market, Poor communication and coordination of the Contractor with other stakeholders, Lack of effective communication & Coordination between project team, Lack of motivation and commitment of project team, Delayed procurement and poor supply chain, Lack of hard currency for procurement, Scarcity of local construction materials at project site (E.g. Quarry, sand…), Poor management system of road traffic at construction site affected effectiveness of construction implementation, Poor management system of workers health and safety at construction site affect workers performance

Cost related challenges; lack of properly defined scope, Late change orders (Additional work, design & specifications change), Incomplete design data, Design error and late design review, Cost variation related error in initial estimation, Price escalation and market instability, Poor project cost management and control system, Poor risk management system, In Security or war in the project area, Lack of proper monitoring and controlling on material utilization.

Quality related challenges; Inadequate contractor experience in the industry, Improper utilization of advance payment by company, Poor quality control system, Failure and rework by the contractor due to quality problem during construction, Corruption and defective works, Poor technical and management skill of Project manager, Poor qualification of the contractor's technical staff, Lack of experience & skill in supervision and design team, Lack of training and capacity building of project team, Poor management system of environmental impact at construction site affects the quality of construction.

2.2. Empirical Study

The study conducted by Hailemeskel Tefera titled "*MANAGEMENT CONTROL OF PROJECTS IN CONSTRUCTION INDUSTRY* Ethiopian Context". The objective of the study is to identify project control problems of construction industry in Ethiopia. The current public construction projects are plagued by poor project management and control, which causes projects to take longer to complete than anticipated, cost more money, and be of lower quality. The following conclusions were drawn by the researcher from the management control of projects research conducted in the Ethiopian construction industry; inadequate local suppliers, consultants, and contractors Lack of money, machinery, equipment, and skilled and unskilled labor, weak performance of the construction sector caused by more than 20% of

it being wasted, the current registration process has turned into a barrier to new entrants and has stolen market opportunities, due to insufficient laws and regulations, there is insufficient control and management capacity, low levels of productivity in terms of the use of labor, machinery, and materials, widespread corruption in the construction sector, significant waste, poor quality delivery, project delays, and cost overruns in the majority of construction projects, there is a lack of modern scheduling techniques, planning and evaluation practices at the project level, as well as a lack of appropriate skilled professionals to support the key actors like consultants, contractors, and clients. Lack of adequate project management and control in terms of time, manpower, material, finances, and quality control There is a lack of qualified personnel to provide project management and control for construction., tasks involving project control and management are not sufficiently understood. A very limited understanding of how to effectively manage and control projects using computer programs, design aids, processes, guidelines, standards, and quality assurance systems are not well developed. During the project implementation phase, labor productivity is low and human resources are not used wisely, the distinction between the roles of consultants, contractors, and clients is unclear; the industry performs poorly due to outdated registration processes and procedures; this does not support a free market environment; rather, it facilitates monopolies; and there are not enough competent institutions for construction-related research and development.

A study by Abadir H. Yimam (2011), titled "*PROJECT MANAGEMENT MATURITY IN THE CONSTRUCTION INDUSTRY OF DEVELOPING COUNTRIES (THE CASE OF ETHIOPIAN CONTRACTORS)"* stated about 50% of the contractors are found to be at incomplete level of PM process maturity (that is on average 50% of the contractors do not perform all the necessary processes that are required to manage construction projects successfully). Further, there was no single contractor which has attained the managed level process maturity. On average 40% of the contractors do not perform all the practices considered to be basic. In fact, on average 40% of the contractors perform only 2/3 of the PM practices that are considered to be basic in managing construction projects. The rest 60% of the contractors are at basic level of practice maturity. Not a single contractor has managed to achieve even intermediate level of PM practice maturity. These findings are indicative of the low level of PM development in the country's construction industry.

A study with title Determinants of Infrastructure Project Delays and Cost Escalations in The Cases of Federal Road and Railway Construction Projects in Ethiopia. The study was carried out by Yenealem Fantahun (2020), The major goal was to identify what factors influence time and cost overruns in

Ethiopian federal road and railway development projects. To do so, the researcher used a purposive sampling methodology to collect data from a specified population of managers and engineers who had suffered delays and cost overruns from the client, contractor, and consultant. The study conducted to determine time and cost overruns in road and railway building projects, Secondary data was gathered from 25 road and three railway projects that were completed between 2014 and May 2018 and evaluated. According to the inquiry, 88 percent of road and 100 percent of railway construction projects were behind schedule, with 80 percent of road and 100 percent of railway construction projects experiencing cost overruns.

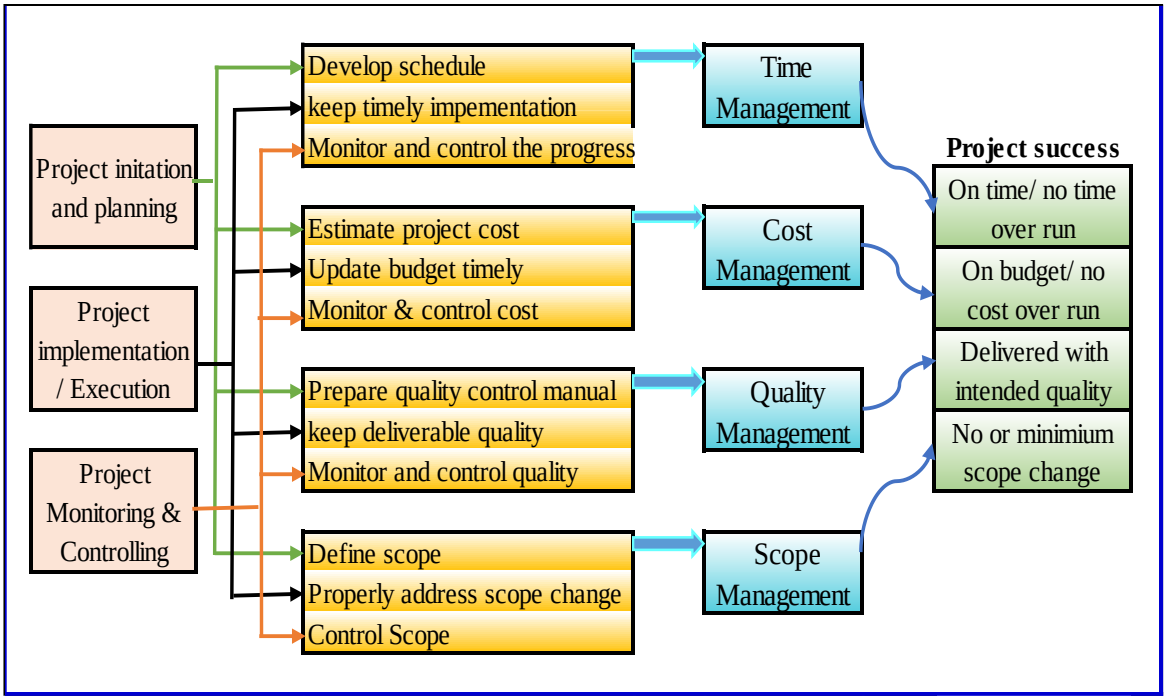
A study with title *A COMPARATIVE ANALYSIS OF COMPETITIVENESS OF DOMESTIC AND FOREIGN CONTRACTORS*: in The Cases of Federal Road and Railway Construction Projects in Ethiopia. The study conducted by Kesto, D. A., & Tsega, B. (2022), stated 45% of the selected Federal Road projects executed by domestic contractors have cost overrun during the construction whereas 6% of the selected Federal Road projects executed by foreign contractors have performed under original contract amount in the same year. The amount cost overrun on average in projects executed by domestics' contractors was 10%. Whereas in 2019 projects executed by foreign was 0.26%. The study on time performance found 80% of the selected Federal Road projects executed by domestic contractors have delay during the construction whereas 48% of the selected Federal Road projects executed by foreign contractors have delay in the same year. The amount of extension of time on average in projects executed by domestics' contractors was 78.71%; whereas in projects executed by foreign was 33.22%.

2.3. Research Gap

Despite the concerted efforts of researchers to comprehensively review various literatures, including those listed above, a shortage of studies that investigate and clarify the project management practice of contractors in Ethiopia's road construction sector & within the construction industry. In addition, various related literatures as forwarded in their findings, they set different factors as reason for failure of project objective. Accordingly, this study tried to collect multiple variables sourced on previous related literatures and to find out the impact of each problem those related to time, cost, quality & scope of the project by justifying the accuracy and tried to identify the top critical factors that adversely affect the project objective.

2.4. Conceptual Framework

Figure 2.6 Conceptual framework



Compiled from different books and literatures

CHAPTER THREE

3. RESERCH METHODOLOGY

3.1 Introduction

The main topics included in this chapter are research design, research approach, the population and sampling technique, data collection tools & data Source, data analysis and ethical considerations in detail. The objective of this study is to identify the status of Project management practical application in areas of project time, cost, quality & scope management. In addition to identify the impact level of different variables on project performance that causing scope change, time overrun, cost overrun & quality problems.

3.2 Research Design

Research designs are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. (Cresswell,2009) "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure." The available literature refers to the common methodology in research clarifies the presence of diversely categorized research typologies. Research can be characterized into three main categories, namely quantitative research, qualitative research, and mixed research – that is a combination of quantitative and qualitative methods, based on the nature of data employed (Creswell, 2012). The concept of research design entails the formulation and configuration of an investigative approach that is strategically crafted to derive solutions to pertinent research inquiries (Cooper & Schindler, 2014).

The present study utilized a descriptive research design. The descriptive research design pertains to the depiction of the distinctive attributes of a particular phenomenon. This research adopted an inductive methodology, commencing with a broad observation of the current project management practices employed by Ethiopian road construction contractors, with the aim of identifying strategies to enhance the effectiveness of the project process and management systems used by local contractors.

The primary objective of this research endeavor is to evaluate and determine the prevailing state of project management practice in the context of Ethiopian road construction projects. Specifically, the study aims to clarify typical limitations and issues that are commonly encountered within Project Management Knowledge Areas (PMKAs), with particular emphasis placed upon Project Time Management, Cost

Management, Quality Management & Scope Management. In order to evaluate and determine barriers to the effective advancement of the project's initiation, planning, execution, and closure processes, as well as to direct the project team's operations towards attaining all established objectives within predetermined limitations of scope, time, quality, and budget, the need for an assessment arises. To endeavor towards the realization of the identified discrepancy, a variety of undertakings was executed to make the proposed Project Management framework.

The questionnaire included three parts and those included 5 questions to identify the demography of the respondents, the second part contains about 15 questions to identify the level of actual practice on Project management practice, The third section contains about 48 questions to assess and identify the major causes of time overrun, cost overrun, quality problems & Scope change in Ethiopia construction projects. Based on the survey, a total of 60 questionnaires were distributed. In order to assess the effectiveness of project management practices and identify significant management challenges within the industry, the data acquired from the survey was subjected to statistical analysis utilizing mean score and standard deviation measures.

3.3 Research Approach

A mixed research approach was used to achieve the investigation's primary goal which encompassed both quantitative and qualitative techniques. The utilization of a mixed method approach confers an advantageous outcome by reducing the limitations of each individual approach and instead leveraging their respective strengths in a synergistic way (Mark, 2009).

Mixed methods design refers to the incorporation or integration of qualitative and quantitative research approaches, as well as their respective data sets, into a research study. In the early development of mixed methods research, it was hypothesized that each individual methodology possessed inherent biases and limitations. By selecting a research approach that incorporates both quantitative and qualitative data collection methods, the weaknesses of each approach are effectively mitigated, thus yielding a more comprehensive and balanced understanding of the research phenomenon at hand. The process of triangulating data sources in research.

Jick (1979) introduced a methodology that aimed to attain convergence between qualitative and quantitative research approaches. During the early 1990s, there was an intensive effort belong to mixed methods to systematically converge both quantitative and qualitative databases, thus giving rise to the notion of integration across various research designs. The subject of these designs underwent

comprehensive discussion in a significant manual that focused on the area of study and was published in 2003 (Tashakkori & Teddlie, 2010).

3.4 Research Population and Sampling

3.5.1 Population of the study

Population of the study is by random selection of ongoing projects and projects that are completed in in the last 5 years period of time that are the road construction projects which have been constructed and under construction with Ethiopian Contractors from beginning of 2018 up to end of 2022. In addition, for primary data the selected target populations are professionals which are working in road construction projects under contractor side, consulting firm & under Ethiopian Road Administration. The selected respondents are ERA team (Team leader, Counterpart, Project Engineer & other Expert), Resident Engineer, Ass. Resident Engineer, Project Manager, Construction Engineer, Office Engineer, Material Engineer, Other key staffs of consultant & Contractor's other key staffs.

For the secondary data collection and interpretation, the number of data gathered from contractors and additional data retrieved from the ERA website were examined. The methodology implemented in this study was formulated with great care and consideration to ensure accuracy and effectiveness. The present investigation encompasses concluded and ongoing projects spanning from the year 2018 to 2022. The research employed purposive sampling technique to facilitate the selection of a particular cohort. Specifically, the investigation targeted high-contract-volume as well as intricately-designed projects, owing to the potential risks associated with underestimated costs and delayed timelines. The completion of projects or their attainment of an acceptable stage is an imperative factor for discerning the comprehensive project delay and the escalation of cost and quality performance. The selection of the respondents for our study on road construction projects, considered a valuable instrument in gathering data from a specific subset of the population deemed most knowledgeable about the topic at hand.

3.5.2 Sampling method

The survey, which was intentionally designed for the purpose of this study, was subsequently distributed to each professional selected through a stratified random sampling technique. This particular target population consisted of individuals working under Construction firms, Consulting firms and clients

involved in the project. The sampling carried out are by selecting the road construction projects that under construction or completed in previous five years period of time from 2018-2022, more than 200 million Ethiopian birrs. Purposive sampling was used, the reason for selecting the higher the contract volume and the more involved the projects, the greater the risk of missing estimated costs and timelines. and the projects must be completed or must be at the acceptable stage to estimate the overall project delay and escalation of cost and quality performance. For the primary data source, the respondents were chosen using random sampling, by using structured interview questionnaire and it distributed by using social Medias like telegram and emails.

3.5 Data collection tool and data source

3.6.1 Data sources

In order to sufficiently address the research questions, a combination of primary and secondary data sources was utilized for the purpose of analysis. The primary data gathered through questionnaires and interview by preparing online questionnaire which distributed through different social media, email address. In addition, as an option the printed questionnaire and other offline questionnaires prepared and distributed in some projects with difficulty of internet access. The secondary data used in this study was compiled through a review of the literature on the procedures and difficulties involved in road construction projects. The purpose of literature reviews was to improve comprehension of the theory underlying the research problem. Secondary information was gathered from publications like journals, documents, and other people's research papers, ERA sources, Firms internal and external reports.

Primary data source: obtained directly by structured questionnaire which included Part I respondents' demographic data, Part II questions targeted to identify the status of project management practice & part III questions targeted to identify major factors for project related challenges. Which collected from 18 different representative projects and 40 respondents that working in road construction projects and who directly involved on project management process.

Secondary data source: Different literatures, project reports, ERA reports, Payment certificates and other sources is used. To analyze time and cost overrun data collected from ERA performance evaluation reports of local contractors & 84 projects that awarded from Beginning of 2018 up to end of 2022. This study aims to present essential details regarding the project, including its projects initial contract period

vs. revised contract period, the cost variation of the projects i.e., initial estimated cost vs. revised contract cost, the performance rate of the projects regarding to its completion or progress.

3.6.2 Data Collection tools

The survey method was employed in the study because it allowed the researcher to gather opinions on the procedures and difficulties associated with managing construction projects in Ethiopia, specifically those involving the construction of roads. According to Creswell (2008), by examining a sample of that population, survey research provides a quantitative or numerical description of the trends, attitudes, or opinions of that population. Additionally, among the projects, road project practices and factors that negatively affect project management have been chosen and thoroughly reviewed as data collection for the study in order to identify the factors in detail. As per Slake (l995) cited in Creswell (2008), Case studies are investigative techniques in which the researcher thoroughly examines a plan, occasion, activity, and process. In addition, secondary data collected from different sources to identify the extent of problems. As a result, researchers attempt to gather comprehensive data using interview questionnaire, and data collected from different sources and about eighteen projects. Accordingly, the research analyzed by Microsoft Excel as a means of filtering potential projects in alignment with the specified study scope, with the ultimate goal of fulfilling the identified objectives.

Structured interview

The close ended and open-ended questions prepared and distributed to each respondent the same series of questions. There is typically not much room for variation in answers, and the interview guide contains few open-ended questions. The format of the questions is standardized, and they are asked in the same order and manner throughout all interviews. The study encompasses diverse parameters that were surveyed. The data collected from the survey includes respondent personal information, such as their past work experience and duration of employment. This information was obtained to gain a comprehensive understanding of the participants' backgrounds and their perspectives on the topic at hand. This study examines the extent of responsibility for the road project, as well as the involvement of various stakeholders in the implementation process.

Document review

The objective of document review was to verify that proper procedures of and steps to act of administering works has been regularly observed. In document review the background data from different source collected and used as input to verify the scheme of the study. The document review in order to acquire pertinent data regarding the current state of a project including its scope, time cost, and quality. In addition, identify causes contributing to cost and time overruns, by utilizing the aforementioned documents, the researcher was able to establish a measure of Time, Cost & Quality performance and ascertain the underlying factors causing deviations in both project timeline and financial expenditures.

3.6 Data Analysis

The present study engaged secondary data, which was then analyzed with the aid of the Microsoft Excel. The quantification of the extent of schedule deviation and cost variation by using of all road projects that awarded from beginning of 2018 up to end of 2022 during the 5 years period of time. The data obtained from the conducted survey was subjected to analysis through the implementation of descriptive statistical methods. The study has endeavored to assess the importance of every individual factor. Descriptive statistics is a branch of statistics that involves the analysis and interpretation of quantitative data sets. It is commonly used to summarize and describe the characteristics and patterns exhibited by data sets, and to make inferences about the larger population from which the data was collected. Descriptive statistics encompasses various measures of central tendency, such as mean, median, and mode, as well as measures of dispersion, such as range and standard deviation. Moreover, it often involves the use of graphical representations, such as histograms, box plots, and scatter plots to visually depict data sets. Overall, descriptive statistics serves as a powerful tool for researchers and analysts to gain insights into the nature and characteristics of their data, and to communicate their findings in a clear and concise manner.

Quantitative analysis was conducted utilizing measures such as mean, frequencies, standard deviation, and percentages. The process of analyzing raw data with the intention of extracting useful insights and drawing informative conclusions can be referred to as data analysis. The analyzed data was presented utilizing graphical aids, such as tables, charts, and figures.

Average contract period in a year= Mean= $\sum x/n$

Where, • x is duration of project in days

• n is number of projects each year.

Time overrun = Contract Period (Time planned – Time elapsed)

Average contract amount =Mean = $\sum x/n$

Where, • x is contract amount in METB

• n is number of projects.

Cost overrun= contract amount (Average Revised – Average Original)

3.7 Validity and Reliability

The assessment of the research's validity and reliability was duly considered. The questionnaire and interview questions were formulated in accordance with the conceptual framework of the study, with the purpose of addressing the intended assessment inquiries and aims. Data collected from 42 respondents & out of these 2 are invalid and 40 are valid. Which contain about 15 questions to identify the level of practice and about 48 questions to identify the project affecting factor. By using MS excel 2019 the data processed, analyzed & presented with descriptive way which included percentage, rank and relative importance index. The statistical program, Statistical Package for the Social Science (SPSS) version 27, was used to assist reliability analysis. Reliability by using statistical tools SPSS test was made to examine the internal consistency using Cronbach's Alpha and resulted 0.961 & the reliability of a scale is deemed to be satisfactory. Sekeran (2003) contends that reliability denotes the degree of stability and consistency exhibited by an instrument regarding time and diverse items.

Ethical considerations

Throughout the research process, the researcher adhered to morally sound procedures. The purpose of the study was explained to the respondents during the primary data collection process before any information was gathered from them. Additionally, the participants' true identities were kept a secret. Every source used was acknowledged when examining secondary data from journals, articles, various books, and related sources.

CHAPTER FOUR

4. DATA ANALYSIS, PRESENTATION AND DISCUESSTION

4.1 Introduction

This present chapter addresses the subject matter surrounding the execution of road projects, whereupon this specific section undertakes a comprehensive data analysis, presentation and discussion. After detail literature review the data collected by two ways, which are primary data by preparing detail structured interview questionnaire which included; part one demographic status of the respondents, in part two about 40 questions to identify the level of practice in project management process & the maturity level of project management knowledge areas practice in Ethiopian construction industry, part three 48 questions prepared based on previous litterateurs and practical observations which to identify factors affecting the project performance that are as challenges in project management and reasons for non-effective project management based on factors which adversely affecting the objective of project management. All of those challenges are the causes of time overrun, cost overrun and poor quality of the project deliverables including defective work and failure. In addition, these factors directly affect the scope of the projects. To identify the effect of each variables data collected from primary source.

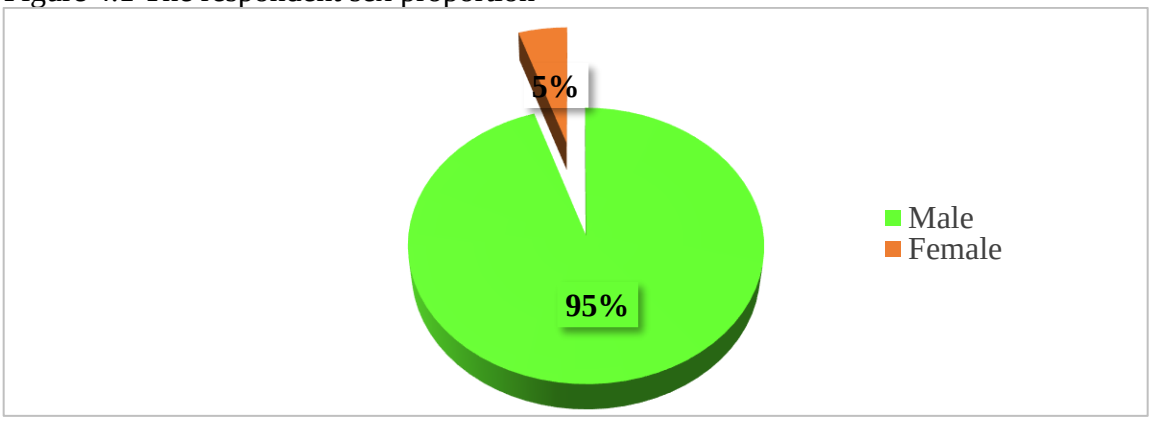
In order to understand the respondent's general demographic data who are participating on survey questionnaire are included about five questions to identify their age, sex, educational background, work experience, and responsibility at evaluated projects. This background data is necessary to understand the participant diversity in their field of responsibility on project, educational background and experience, inclusiveness of gender, various age groups, level of experience and knowledge in that area, education and field of specialization.

Table 4.1 The result of the respondent rate

Parties	Questionnaire			Percentage (%)	
	Distributed	Responded	Valid	Returned from distributed	valid from responded
Contractor	35	25	24	71%	96%
Consultant	20	16	15	80%	94%
Client	5	1	1	20%	100%

- **Sex of respondents**

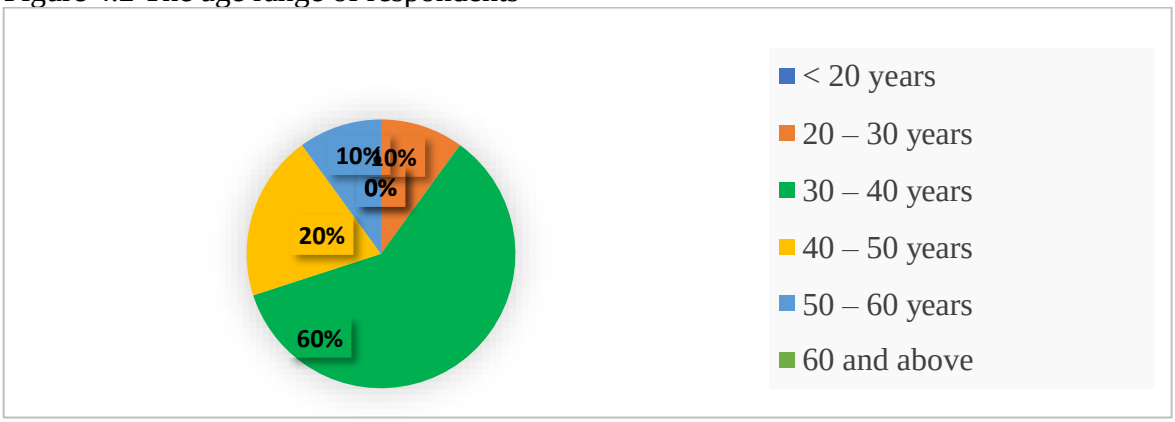
Figure 4.1 The respondent sex proportion



Out of 40 respondents 95% of the respondents are male &5% of the respondents are Female this shows due to the challenging behavior of road construction project no more female join the industry.

- **Age of the respondents**

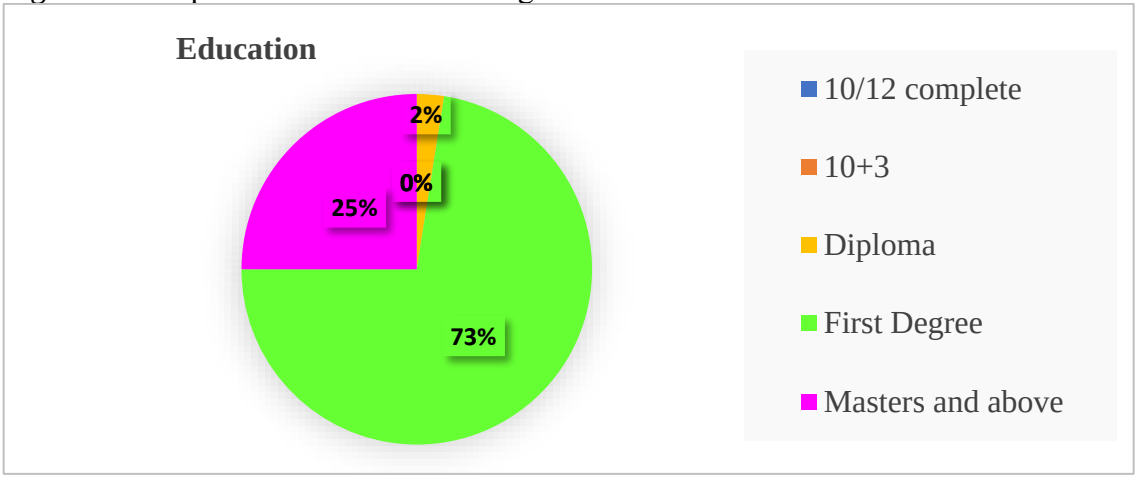
Figure 4.2 The age range of respondents



The age range of respondents who participated in this study are; 10% of the respondents are 20 – 30 years old, 60% of the respondents are 30 – 40 years old, 20% of the respondents are 40 – 50 years old & 10% of the respondents are 50 – 60 years old. This indicates most of the project management team found in the range of 30 to 40 years.

- **Level of education**

Figure 4.3 Respondents' education background

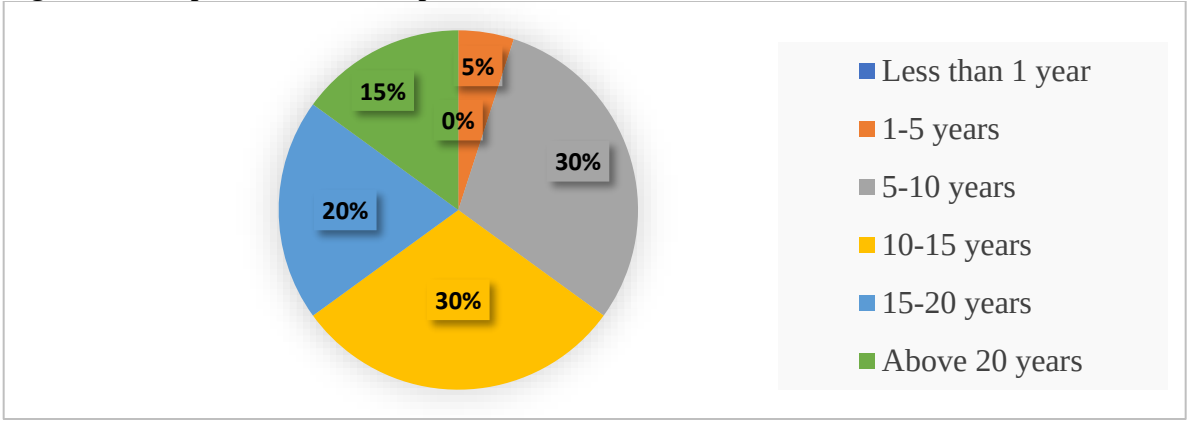


The education background of respondents who participated in this study are; 2.5% of the respondents are Diploma, 72.5% of the respondents are First Degree, 25% of the respondents are Masters and above. Which shows almost 2/3 of the respondents are the First-Degree holders.

- **Work Experience**

By participating well experienced professionals helps to identify the right perceptions and better understanding from their prolonged exposure on the area.

Figure 4.4 Respondents work experience



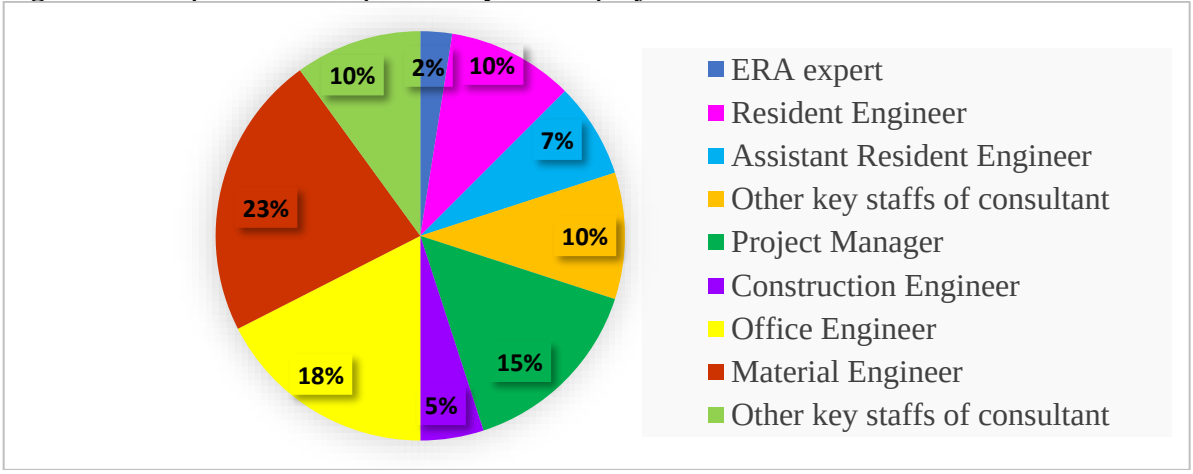
The work experience of respondents who participated in this study are; 5% of the respondents have 1-5 years' experience, 30% of the respondents have 5-10 years, 30% of

the respondents have 10-15 years, 20% of the respondents have 15-20 years & 15% of the respondents have above 20 years of experience. That expresses about 65% of respondents have more than 10 years of experience. This shows, they can well express the real extent of practice.

- **Responsibility/ position on the project**

The questionnaire addressed the selected targeted population that the project management team of senior staffs and department head who are directly participate on project management, supervision and controlling process. Which diversity of responsibility helps to get better information from their specific experience, different perceptions and subsequently to justify based on broad view.

Figure 1.5 Respondents' responsibility on the project



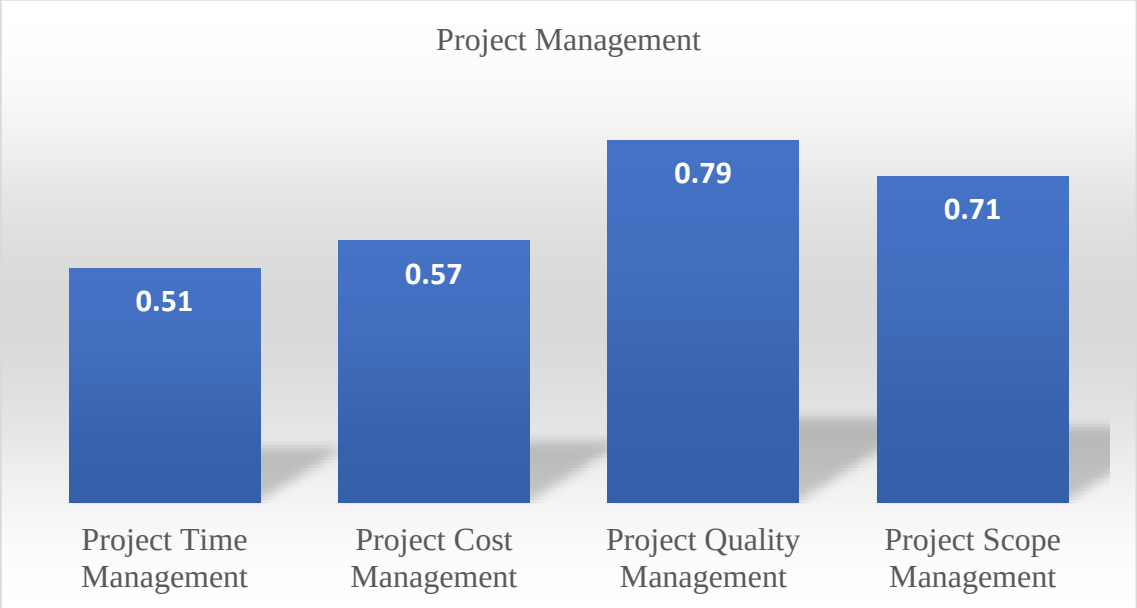
The responsibility or position of respondents who participated in this study are; 2.5% of the respondents are ERA expert, 10% of the respondents are Resident Engineer, 7.5% of the respondents are Assistant Resident Engineer, 10% of the respondents are Other key staffs of consultant, 15% of the respondents are Project Manager, 5% of the respondents are Construction Engineer, 17.5% of the respondents are Office Engineer, 22.5% of the respondents are Material Engineer, 10% of the respondents are Other key staffs of the project.

Project Management

This main objective of the study was to assess and identify the status of project management practice and common defects that have been observed in Ethiopian road construction projects regarding to Project Management by focusing on Project Time Management, Cost Management, Quality Management & Scope Management. In addition, to assess & identify the major problems which adversely affect project success & causes for Time overrun, Cost overrun, Quality problems & Scope change. The study has been carried out on Federal Road construction projects which undertaken by domestic contractors. Accordingly, one of the areas of study was to identify the level of practice in project management of road construction project in Ethiopia.

To identify the level of practice in the area of project management the primary data has collected, analyzed, and discussed as follow. The data collected from 40 respondents that included 15 questions to identify the level of practice on time management, cost management, quality management & Scope management. This included the practice of planning, implementation, monitoring and controlling process of the project. Based on the respondent's response the following data analysis has been carried out and presented as shown below.

Figure 4.6 Level of practice in project management

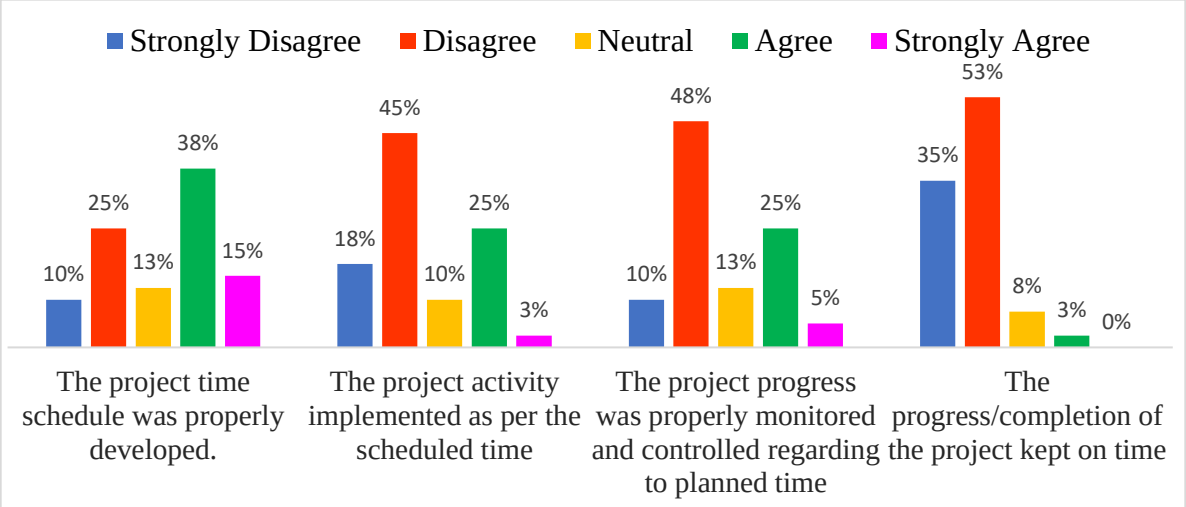


According to the primary data, that collected from 40 respondents. Project Quality Management & Project Scope Management is found on the level of acceptable practice with relative importance index (RII) of 0.79 & 0.71 respectively. Project Cost Management & Project Time Managements are found at low level of practice with relative importance index (RII) 0.57 & 0.51 respectively.

4.1.1 Project Time Management

This section presented, discussed, and analyzed time management practice, time overrun and reason for time overrun in Ethiopian Road construction projects that undertaken by domestic contractors with respect to average time performance vs. actual progress of the project. To identify and analyze the level of practice on project time management the primary data collected from 40 respondents regarding to schedule development, activity implementation vs schedule, monitoring and controlling of the project progress vs schedule & evaluation of time performance. Thus, the data presented, as shown in the graph below.

Figure 4.7 Level of project time management practice



Source from questionnaire survey on May 2023

As shown on the table above 40 respondents were asked about the level of practice on Project Time Management, and on average they responded 18% Strongly Disagree, 43% Disagree, 11% Neutral, 23% Agree, 6% Strongly Agree, which is relative importance index (RII) of 0.51. Thus, the time management practice in 18 % of projects has poor time management, 43 % Low level, 11 % medium level, 23 % of projects good & only 6 % very

good time management.

4.1.2 Time overrun/ Behind the schedule

To identify and analyze the time performance of the projects data collected from the source of ERA report based on performance evaluation of local contractors. As shown in the table below 84 projects that have been awarded from the beginning of 2018 up to end of 2022. For data analysis purpose the reporting period for each project has taken the last or recent cumulative progress. In some project cases due to lack of the recent report, the nearest or the last cumulative progress has taken and time performance calculated as follows.

- Commencement date (A)
- Reporting date (B)
- Total contract period (C)
- Time elapsed/utilized time until evaluation date (D = B-A)
- Expected progress in % (E=D/C)
- Actual progress in percent=(F) from report
- Time performance /time over run (G=E-F)

Table 4.2 Time performance of projects that undertaken by local contractors

Sr. No.	Contract Name	Commencement date (A)	Reporting date (B)	Total contract period (months) (C)	Time elapsed until evaluation date (D)	Expected progress in % (E)	Actual progress in percent (F)	Time performance (G)	Status
1	Melkasa-Sodere-Nuraera-Metehara	1-Jan-18	31-Jan-23	66.2	60.98	89%	50.1%	39%	Lag
2	Kunzila Horticulture Farm Zege Town	23-Jan-18	31-Jan-23	61.8	60.25	93%	61.9%	31%	Lag
3	Woldia Town Section	24-Feb-18	31-Jan-21	43.2	35.22	77%	44.9%	32%	Lag
4	Guguftu - Wereilu - Degolo	23-Aug-18	31-Jan-23	52.9	53.29	97%	32.7%	64%	Lag
5	Ajire - Keraker	21-Sep-18	31-Jan-23	53.3	52.34	93%	60.2%	32%	Lag
6	Oblo-Dermi	9-Oct-18	31-Jan-23	46.9	51.75	100%	84.5%	16%	Lag
7	Debrebirhan - Ankober	23-Oct-18	31-Jan-23	55.50	51.29	84%	79.7%	5%	Lag
8	Robe -Gasera - Ginir (Contract 2:)	9-Nov-18	31-Jan-23	36.00	50.73	100%	34.0%	66%	Lag

Sr. No.	Contract Name	Commencement date (A)	Reporting date (B)	Total contract period (months) (c)	Time elapsed until evaluation date (D)	Expected progress in % (E)	Actual progress in percent (F)	Time performance (G)	Status
9	Wukro-Atsbi-Koneba	17-Dec-18	31-Jan-21	41.9	25.49	56%	30.4%	26%	Lag
10	Adiarkay - Telmet	17-Dec-18	31-Jan-23	41.9	49.48	100%	20.3%	80%	Lag
11	Taremaber-Meleya-Molale-Sefemeda	24-Dec-18	31-Jan-23	47.70	49.25	97%	20.2%	76%	Lag
12	Robe-seru	18-Jan-19	31-Jan-21	36.0	24.44	62%	2.3%	60%	Lag
13	Kelela-Akesta	22-Jan-19	31-Jan-23	24.00	48.30	100%	37.0%	63%	Lag
14	Edo - Serofta - Warqa	24-Jan-19	31-Jan-23	56.0	48.23	81%	60.6%	21%	Lag
15	Dongoro-Kingi-Mekebilla	31-Jan-19	31-Jan-23	46.0	48.00	97%	69.3%	28%	Lag
16	Omorate-Omo Bridge-Gynayom-Kangaken	7-Feb-19	31-Jan-23	49.0	47.77	93%	71.9%	21%	Lag
17	Rama-Chilla	1-Apr-19	31-Jan-21	38.3	22.05	54%	28.7%	25%	Lag
18	Adisheru - Dela - Samre	9-May-19	31-Jan-21	36.0	20.80	53%	6.2%	47%	Lag
19	Warder - Kebridehar	10-Jun-19	31-Jan-23	48.00	43.73	85%	52.2%	33%	Lag
20	Jijiga - Gelesh - Deghamdo - Segege,Lot 4	22-Jul-19	31-Jan-23	44.7	42.35	88%	56.5%	32%	Lag
21	Asaita- Afambo-Djibouti Border	26-Aug-19	31-Jan-23	44.8	41.20	86%	79.1%	6%	Lag
22	Debre Markos - Debre Elias	18-Sep-19	31-Jan-23	43.8	40.44	86%	50.6%	35%	Lag
23	Korem-Sekota-Abi Adi , Lot II:	26-Sep-19	31-Jan-21	36.0	16.20	41%	1.7%	39%	Lag
24	Korem-Sekota-Abi Adi , Lot III:	1-Oct-19	31-Jan-21	36.0	16.03	41%	25.3%	15%	Lag
25	Continuation of Werabe - Bojaber	1-Oct-19	31-Jan-23	40.2	40.02	92%	42.7%	49%	Lag
26	Continuation of Ambo - Wolliso	25-Nov-19	31-Jan-23	38.8	38.21	93%	22.9%	70%	Lag
27	Bishoftu - Chefe Donsa - Sendafa	27-Nov-19	31-Jan-23	52.70	38.14	68%	34.8%	33%	Lag
28	Bahirdar-Tis Esat	16-Dec-19	31-Jan-23	57.8	37.52	61%	31.5%	30%	Lag
29	Ginchi - Kachise -Chuleti; Contract 2	31-Dec-19	31-Jan-23	32.6	37.03	100%	15.2%	85%	Lag
30	Yabelo Town Bypass	8-Jan-20	31-Jan-23	26.10	36.76	100%	78.0%	22%	Lag
31	Korem-Sekota-Abi Adi, Contract I:	14-Feb-20	31-Jan-21	36.0	11.56	29%	17.7%	12%	Lag
32	Gonji-Kolela(Korie-Addisal)	15-Apr-20	31-Jan-23	32.2	33.54	99%	63.0%	36%	Lag

Sr. No.	Contract Name	Commencement date (A)	Reporting date (B)	Total contract period (months) (c)	Time elapsed until evaluation date (D)	Expected progress in % (E)	Actual progress in percent (F)	Time performance (G)	Status
33	Gishen Junction	27-May-20	31-Jan-23	41.2	32.16	72%	4.7%	67%	Lag
34	Fik - Segeg - Gerbo - Denen Lot 3:	16-Jul-20	31-Jan-23	42.00	30.52	67%	39.2%	28%	Lag
35	Jigjiga-Fafen-Gelelesh Degehamedo-Segeg (Lot 2 & 3)	24-Sep-20	31-Jan-23	42.00	28.22	62%	52.8%	9%	Lag
36	Gode-Hargele, Lot 1:	6-Oct-20	31-Jan-23	48.00	27.83	54%	27.6%	27%	Lag
37	Humbo Tsebela - Abaya /Horticulture/	6-Oct-20	31-Jan-23	36.00	27.83	70%	53.4%	17%	Lag
38	Dermi-Kenticha-Shakiso Contract 3	15-Oct-20	31-Jan-23	36.00	27.53	70%	12.1%	58%	Lag
39	Kimir Dingay/Debretabor-Guna	21-Oct-20	31-Jan-23	26.5	27.33	94%	53.3%	40%	Lag
40	Dembecha-Feres bet-Adet; Lot I:	23-Oct-20	31-Jan-23	36.00	27.27	69%	15.0%	54%	Lag
41	Koshe-Mito-Werabe	23-Oct-20	31-Jan-23	36.00	27.27	69%	32.0%	37%	Lag
42	Hawela Tula-Weteraresa-Yayu-Werachie	3-Nov-20	31-Jan-23	42.00	26.91	59%	6.3%	53%	Lag
43	Sawla - Maji, Lot-III: Salayesh-Omo	5-Nov-20	31-Jan-23	24.00	26.84	100%	11.8%	88%	Lag
44	Bulbula - Alage	12-Nov-20	31-Jan-23	36.00	26.61	67%	43.0%	24%	Lag
45	Debre Birhan-Deneba-Lemi & Jihur-Deneba	30-Nov-20	31-Jan-23	48.00	26.02	49%	13.4%	35%	Lag
46	Arbgebeya - Sekela - Tilili, Contract 2	1-Dec-20	31-Jan-23	36.00	25.99	66%	23.0%	43%	Lag
47	Seyo-Shenen-Guder Contract 2	9-Dec-20	31-Jan-23	42.00	25.72	57%	2.5%	54%	Lag
48	Omo-Maji, Lot 1: Omo - Sai	10-Dec-20	31-Jan-23	36.00	25.69	65%	15.0%	50%	Lag
49	Tenta-Gashena, Contract 2:	21-Dec-20	31-Jan-23	45.80	25.33	52%	5.4%	46%	Lag
50	Haik - Bitsma - Chifra	22-Dec-20	31-Jan-23	51.6	25.30	46%	15.6%	30%	Lag
51	Halaba - Angacha - Wato	29-Dec-20	31-Jan-23	36.00	25.07	63%	11.0%	53%	Lag
52	Nejo-Jarso-Begi-Yayo, Lot 1	1-Jan-21	31-Jan-23	48.00	24.97	50%	7.7%	42%	Lag
53	Metu By-Pass	11-Feb-21	31-Jan-23	24.00	23.62	89%	19.3%	69%	Lag
54	Agaro - Gera - Medabo	25-Feb-21	31-Jan-23	48.00	23.16	45%	12.4%	33%	Lag
55	Mankusa - Birsheleko - 145 Kebele	8-Mar-21	31-Jan-23	36.00	22.80	58%	27.6%	30%	Lag

Sr. No.	Contract Name	Commencement date (A)	Reporting date (B)	Total contract period (months) (c)	Time elapsed until evaluation date (D)	Expected progress in % (E)	Actual progress in percent (F)	Time performance (G)	Status
56	Ambo Town - Guder Town	16-Mar-21	31-Jan-23	24.00	22.54	82%	31.1%	50%	Lag
57	Negele Borena-Doloado-Melkasuftu, Lot 1	30-Mar-21	31-Jan-23	36.00	22.08	56%	33.4%	23%	Lag
58	Gelago-Tewodros Ketema	1-Apr-21	31-Jan-23	36.00	22.01	56%	7.0%	49%	Lag
59	Awash-Kulbi-Harar Overlay; Contract 1:	5-Apr-21	31-Jan-23	36.00	21.88	57%	21.8%	35%	Lag
60	Bonosha - Achamo	7-May-21	31-Jan-23	24.00	20.83	75%	29.8%	46%	Lag
61	Gimbi-Guye-Alga - Metu ; Lot -1:	7-May-21	31-Jan-23	48.00	20.83	41%	10.0%	31%	Lag
62	Jigjiga Bypass	14-May-21	31-Jan-23	24.7	20.60	75%	29.5%	46%	Lag
63	Debre Markos-Debre Eliyas -Chagni; Lot 3	17-May-21	31-Jan-23	36.00	20.50	52%	7.0%	45%	Lag
64	Dubti - Arrisa - Adigala - Biyokebob; Lot II	27-May-21	31-Jan-23	36.00	20.17	51%	8.4%	43%	Lag
65	Weyito - Turmi	27-May-21	31-Jan-23	48.00	20.17	39%	18.5%	21%	Lag
66	Dangla - Jawi	3-Jun-21	31-Jan-23	42.00	19.94	44%	12.1%	32%	Lag
67	Fik - Segeg - Gerbo - Denan; Lot II	7-Jun-21	31-Jan-23	42.00	19.81	44%	15.0%	29%	Lag
68	Combolcha Town Bypass	23-Jun-21	31-Jan-23	30.3	19.29	59%	3.3%	55%	Lag
69	Homosha-Hidassie Dam; Lot-1	13-Jul-21	31-Jan-23	42.00	18.63	41%	8.9%	32%	Lag
70	Dembecha-Feres Bet-Adet ; Contract II	21-Jul-21	31-Jan-23	36.00	18.37	47%	7.4%	39%	Lag
71	Eliya - Makuye	23-Jul-21	31-Jan-23	36.00	18.30	46%	1.0%	45%	Lag
72	Gog - Jore - Akobo Contract 1 Lot I	6-Aug-21	31-Jan-23	42.00	17.84	38%	25.0%	13%	Lag
73	Addis-Gibe River Road Overlay ; Lot II	10-Aug-21	31-Jan-23	36.00	17.71	45%	10.1%	35%	Lag
74	Abomsa - Aseko - Dhibu River	10-Aug-21	31-Jan-23	36.00	17.71	45%	13.7%	31%	Lag
75	Haro Wenchi - Wenchi	12-Aug-21	31-Jan-23	16.6	17.64	100%	23.2%	77%	Lag
76	Fik - Segeg - Gerbo - Denan ; Lot I:	30-Aug-21	31-Jan-23	42.0	17.05	38%	19.8%	18%	Lag
77	Abay River Bridge and Approach Lot 2:	15-Sep-21	31-Jan-23	30.00	16.53	49%	23.5%	26%	Lag
78	Bure-Gomer ,	21-Sep-21	31-Jan-23	36.00	16.33	42%	10.5%	32%	Lag

Sr. No.	Contract Name	Commencement date (A)	Reporting date (B)	Total contract period (months) (c)	Time elapsed until evaluation date (D)	Expected progress in % (E)	Actual progress in percent (F)	Time performance (G)	Status
79	Akuila-Achagna-Dima Junction Lot III	8-Oct-21	31-Jan-23	41.4	15.77	35%	22.1%	13%	Lag
80	Jiga - Quarit - Arbgebeya; Contract 1	12-Oct-21	31-Jan-23	36.00	15.64	40%	24.2%	15%	Lag
81	Chanka - Gidami	20-Oct-21	31-Jan-23	48.00	15.38	31%	3.7%	27%	Lag
82	Dimtu - Bilate Military Training Center	14-Apr-22	31-Jan-23	36.00	9.59	24%	7.1%	17%	Lag
83	Abomsa - Aseko - Dhibu River	31-Aug-22	31-Jan-23	32.6	5.03	14%	4.2%	10%	Lag
84	Supe-Darimu-Lalo	21-Oct-22	31-Jan-23	48.00	3.35	7%	1.6%	5%	Lag
	Average time overrun							**38%**	**Lag**

Source ERA report on performance of local contractors

As shown in the table above it is sourced from ERA report that recorded local contractors' performance at every month of their status. These reports are summarized by taking the most recent evaluation report of each project cumulative progress status from the date of project commencement up to the recent reporting period. In general, the evaluation included 84 projects that are awarded for local contractors in previous 5 years period of time from beginning of 2018 up to end of 2022. As per the data on the table above almost all the project progress indicates behind the expected progress, which is minimum 5% lag and maximum 88% lag observed and the average time overrun of the projects are about 38% higher than the planned period of time. Hence this shows the time performance practice is poor in Ethiopian road construction projects that undertaken by local contractors.

As per Yenealem F (2020) 12% of road projects completed on planned schedule, but 88% completed beyond on planned schedule. Delays extended from 6 % to 63% /or 103 to 1831 business days. While the average percentage rate of time overrun was nearly 38% higher than the estimated scheduled.

4.1.3 Cause of Time Overrun/ Behind the schedule

Time overrun is one of the challenges for successful completion of the road construction projects in in Ethiopia. According to secondary data analysis the five years monthly based and cumulative performance report indicates 38%-time overruns is observed in projects under progress which are awarded from 2018 up to end of 2022. To analyze causes of time overrun the researcher in his observation and different literatures identified about 34 factors that adversely affecting the time performance of the project. Subsequently, the survey questionnaire prepared and distributed more than fifteen different projects and with diversified way of distribution addressed professionals from client, supervision team & contractor team those are directly involving on project management activity of the project.

Table 4.3 Causes of time overrun & their relative importance index

Sr. No	Factors that affected project time performance	Response data	
		RII	Rank
1	Delay RoW obstruction and compensation payment by the Client	0.91	1st
2	Delayed change orders (Additional work, design & specifications change)	0.79	2nd
3	Delay decision making by client on pending issues	0.77	3rd
4	Incomplete design data, Design error and late design review	0.72	4th
5	Unforeseen weather condition	0.70	5th
6	unrealistic contract duration and requirements imposed on the contract	0.70	6th
7	Shortage of Construction material in the market	0.67	7th
8	Delay in supply of construction material by the contractor	0.67	8th
9	Shortage of spare parts and extended breakdown time of equipment's	0.67	9th
10	Contractors' difficulties in financing the project during construction	0.67	10th
11	Improper utilization of advance payment by company	0.66	11th
12	Poor project management, in planning monitoring and evaluation	0.65	12th
13	Financial problems (delayed payments for completed work)	0.66	13th
14	Delay in design documents preparation & data approval by consultant	0.65	14th
15	Lack of hard currency for procurement	0.64	15th
16	In Security or war in the project area	0.64	16th
17	Lack of proper plan and schedule by contractor	0.64	17th
18	Poor logistic management system & supply system	0.61	18th
19	Delay in mobilization of construction Equipment's by the contractor	0.61	19th
20	Delayed procurement and poor supply chain	0.61	20th
21	Delay in approval of site works and interim payment by the consultant	0.61	21st
22	Shortage of construction machinery at project	0.59	22nd

Sr. No	Factors that affected project time performance	Response data	
		RII	Rank
23	Delayed commencement of the project by contractor	0.59	23rd
24	Lack of properly defined scope	0.57	24th
25	Lack of proper monitoring and controlling on equipment utilization	0.55	25th
26	Scarcity of local construction materials at project area (E.g., Quarry….)	0.56	26th
27	Delayed handover of project by client to contractor	0.55	27th
28	Lack of effective communication & Coordination between project team	0.54	28th
29	Lack of motivation and commitment of project team	0.52	29th
30	Poor technical and management skill of Project manager	0.50	30th
31	Shortage of labour	0.49	31st
32	Poor communication of the Contractor with other stakeholders	0.48	32nd
33	The effect of Poor traffic management at construction site	0.48	33rd
34	Effect of Social, Cultural and religious related non-working days	0.45	34th

Source from questionnaire survey on May 2023

As per the above table, data collected from 40 respondents the top five critical reason for time overrun are; Delay RoW obstruction and compensation payment by the Client, Delayed change orders (Additional work, design & specifications change), Delay decision making by client pending issues related to contract and other, Incomplete design data, Design error and late design review, Unforeseen weather condition.

The first ranked factor for time overrun is delay RoW obstruction and compensation payment by the Client, which is the relative importance index (RII) of 0.91. The problem caused by the government due to delay compensation payment for removal of obstructions that located in right of way limit of the road construction site. Furthermore, these processes will delay the possession and commencement of construction even the contractor mobilized the resource to specific locations. In addition, as practical site observations, letters regarding to notice and claim are mainly related to delay removal of RoW obstruction.

The second most affecting factor is delayed change orders (Additional work, design & specifications change), which is the relative importance index (RII) of 0.79. This factor is not only affecting the time performance of the project but also affects the cost, quality and causing scope change of the project. The third most affecting factor is delaying decision making by client pending issues related to contract and other, which is the relative

importance index (RII) of 0.77. This is also client related issue that the extended decision-making process is highly affected. The fourth ranked factor is incomplete design data, Design error and late design review, which is the relative importance index (RII) of 0.72. The provision of incomplete design, design error and late design review and reworks are the common practice in Ethiopia road construction projects. The fifth ranked factor is unforeseen weather condition, which is the relative importance index (RII) of 0.70. This is uncontrolled factor and mainly related to climate change and it is global issue.

The next critical factors that ranked from 6th to 10th are; unrealistic contract duration and requirements imposed on the contract, shortage of Construction material in the market, delay in supply of construction material by the contractor, shortage of spare parts and extended breakdown time of equipment's & contractors' difficulties in financing the project during construction, which are the relative importance index (RII) of 0.70, 0.67, 0.67, 0.67 & 0.67 respectively.

As Yenealem F (2020) prevailed in his previous study the top five factors for time overrun are; Incomplete studies prior to project approval, Poor project management and coordination, Right-of-way acquisition issues, Inaccurate forecasting of project schedule, Shortage of equipment and materials.

In correlating the studies delay RoW obstruction and compensation payment by the Client is set the 1st ranked in this study and 3rd ranked in the above literature. So, it can take as critical factor and in addition this can be justified by different notices and claim letters. Delayed change orders (Additional work, design & specifications change) this are the second factor and mainly it affects the time performance related to scope change. This can be justifying by additional variation orders and extension of time granted for change orders are as evidence in most of the projects. Delay decision making process by client pending issues related to contract and other. This factor justified by persistent notices and claim letters that forwarded from contractor to client and also one of the most reasons for delayed of change orders are the excessive delay of clients on decision making process. Incomplete design data, Design error and late design review are forth ranked in this study but the second ranked factor as per Yenealem F (2020). Unforeseen weather condition is the fifth

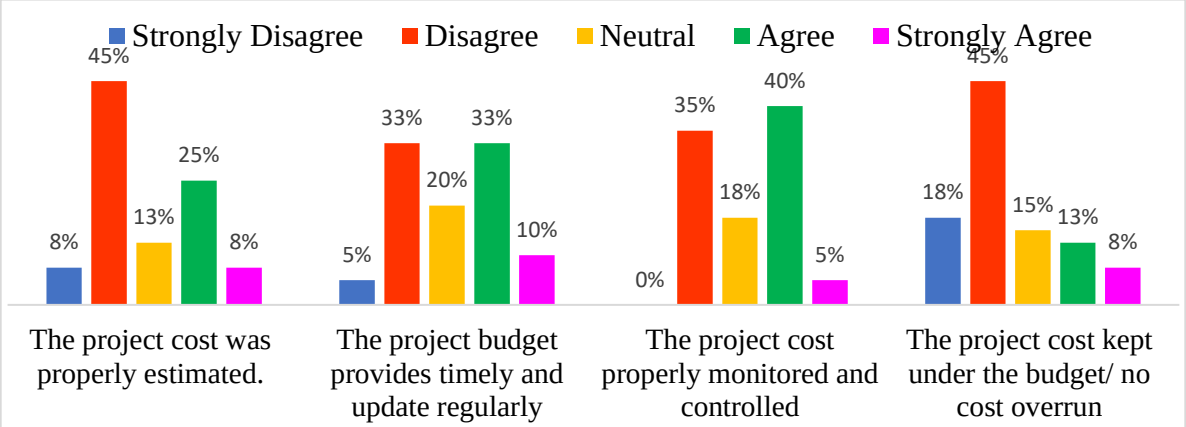
factor in this study, but set on the 9th factor according to Yenealem F (2020)

Generally, the above justifications show the similarity of impact in most factors but some of them are varies related to type of project, study period, respondent's knowledge and justification and other different factors. Based on compiled data that sourced from ERA report shows the average rate of time overrun in this study is 38% behind the schedule. This result is found at equal level with previous finding that reported by Yenealm F (2020).

4.2 Project Cost Management

This section presented, discussed, and analyzed cost management practice, cost overrun and reason for cost overrun in Ethiopian Road construction projects that undertaken by domestic contractors with respect to average planned cost vs. actual cost and evaluate cost variation extra budget of the project. To identify and analyze the level of practice on project cost management the primary data collected from 40 respondents regarding to project cost estimation, budgeting, cost controlling & evaluate budget deviation. Thus, the data presented, as shown in the graph below

Figure 4.8 Level of project cost management practice



Source from questionnaire survey on May 2023

As shown on the table above 40 respondents were asked about the level of practice on Project Cost Management, and on average they responded 8% Strongly Disagree, 39% Disagree, 16% Neutral, 28% Agree, 8% Strongly Agree, which is relative importance index (RII) of 0.57. Thus, cost management practice in 8 % of projects has poor cost management, 39 % Low level, 16 % medium level, 28 % of projects good & only 8 % very good cost management.

4.2.1 Cost overrun / over budget

To identify and analyze the cost performance of the projects data collected from the source of ERA report based on performance evaluation of local contractors. As shown in the table below 84 projects that have been awarded from the beginning of 2018 up to end of 2022. For data analyses purpose the cost variation taken by deducting the revised contract amount from initial contract amount which are analyzed as shown below.

- Initial contract amount (ETB) = A
- Revised Contract Amount (ETB) = B
- Cost variation (ETB) = (C= B-A)

Table 4.4 Projects contract cost variation

Sr. No	Contract Name	Initial contract price (ETB)	Revised Contract Price (ETB)	Cost variation (ETB)
1	Melkasa-Sodere-Nuraera-Metehara	1,203,129,756.2	1,440,812,001.1	237,682,245
2	Kunzila Horticulture Farm Zege Town	554,487,294.1	567,129,584.4	12,642,290
3	Woldia Town Section	304,970,158.9	304,850,794.3	(119,365)
4	Guguftu - Wereilu - Degolo	1,394,828,055.4	1,425,504,421.3	30,676,366
5	Ajire - Keraker	1,158,659,797.0	1,158,659,797.0	-
6	Oblo-Dermi	893,493,729.0	800,793,953.7	(92,699,775)
7	Debrebirhan - Ankober	1,083,570,868.2	1,623,194,217.9	539,623,350
8	Robe -Gasera - Ginir (Contract 2:)	841,602,019.2	841,602,019.2	-
9	Wukro-Atsbi-Koneba	1,745,722,493.9	1,745,722,493.9	-
10	Adiarkay - Telmet	1,981,378,049.6	1,745,722,493.9	(235,655,556)
11	Taremaber-Meleya-Molale- Sefemeda	1,906,200,296.8	1,906,200,296.8	-
12	Robe-seru	993,181,495.4	993,181,495.4	-
13	Kelela-Akesta	568,348,055.4	568,348,055.4	-
14	Edo - Serofta - Warqa	1,687,343,877.3	1,707,587,062.3	20,243,185
15	Dongoro-Kingi-Mekebilla	416,237,136.1	477,299,213.0	61,062,077
16	Omorate-Omo Bridge-Gynayom-Kangaken	965,890,930.4	992,020,056.2	26,129,126

Sr. No	Contract Name	Initial contract price (ETB)	Revised Contract Price (ETB)	Cost variation (ETB)
17	Rama-Chilla	1,479,881,513.1	1,479,881,513.1	-
18	Adisheru - Dela - Samre	2,114,048,067.8	2,114,048,067.8	-
19	Warder - Kebridehar	1,814,123,577.9	1,814,123,577.9	-
20	Jijiga - Gelesh - Deghamdo - Segege,Lot 4	768,698,951.1	754,637,509.7	(14,061,441)
21	Asaita- Afambo-Djibouti Border	1,518,683,761.5	1,660,417,932.7	141,734,171
22	Debre Markos - Debre Elias	1,299,644,371.6	1,299,644,371.6	-
23	Korem-Sekota-Abi Adi, Lot II:	1,568,831,426.4	1,568,831,426.4	-
24	Korem-Sekota-Abi Adi, Lot III:	1,021,950,000.0	1,021,953,000.0	3,000
25	Continuation of Werabe - Bojaber	795,000,000.0	795,000,000.0	-
26	Continuation of Ambo - Wolliso	1,264,907,396.1	1,264,907,396.1	-
27	Bishoftu - Chefe Donsa - Sendafa	914,847,890.5	975,859,896.2	61,012,006
28	Bahirdar-Tis Esat	767,050,000.0	957,930,208.4	190,880,208
29	Ginchi - Kachise -Chuleti; Contract 2	1,267,054,518.9	1,267,054,518.9	-
30	Yabelo Town Bypass	296,853,599.2	296,853,599.2	-
31	Korem-Sekota-Abi Adi, Contract I:	2,121,050,000.0	2,121,050,000.0	-
32	Gonji - Kolela (Korie - Addisalem)	333,027,799.7	333,027,799.7	-
33	Gishen Junction	1,316,700,000.0	1,316,700,000.0	-
34	Fik - Segeg - Gerbo - Denen Lot 3:	1,119,417,453.4	1,119,417,453.4	-
35	Jigjiga - Fafen - Gelelesh - Degehamedo - Segeg: (Lot 2 & 3)	1,828,264,182.8	1,773,642,189.1	(54,621,994)
36	Gode-Hargele, Lot 1:	1,893,759,386.7	1,893,759,386.7	-
37	Humbo Tsebela - Abaya /Horticulture/	699,000,000.0	699,000,000.0	-
38	Dermi-Kenticha-Shakiso Contract 3	1,720,437,945.4	1,720,437,945.4	-
39	Kimir Dingay/Debretabor-Guna	416,000,000.0	416,000,000.0	-
40	Dembecha-Feres bet-Adet; Lot I:	1,790,005,720.7	1,790,005,720.7	-
41	Koshe-Mito-Werabe	1,850,695,155.0	1,850,695,155.0	-
42	Hawela Tula-Weteraresa-Yayu-Werachie	1,829,883,517.0	1,829,883,517.0	-

Sr. No	Contract Name	Initial contract price (ETB)	Revised Contract Price (ETB)	Cost variation (ETB)
43	Sawla - Maji, Lot-III: Salayesh-Omo	508,349,626.4	434,267,538.9	(74,082,087)
44	Bulbula - Alage	686,000,000.0	878,514,732.4	192,514,732
45	Debre Birhan-Deneba-Lemi & Jihur-Deneba	3,613,766,908.7	3,613,766,908.7	-
46	Arbgebeya - Sekela - Tilili, Contract 2	1,673,300,137.7	1,673,300,137.7	-
47	Seyo-Shenen-Guder Contract 2	3,640,009,480.1	3,640,009,480.1	-
48	Omo-Maji, Lot 1: Omo - Sai	1,882,967,504.8	1,882,967,504.8	-
49	Tenta-Gashena, Contract 2:	1,434,519,841.5	1,476,476,550.6	41,956,709
50	Haik - Bitsma - Chifra	2,138,481,835.7	2,138,481,835.7	-
51	Halaba - Angacha - Wato	1,980,658,256.3	1,980,658,256.3	-
52	Nejo-Jarso-Begi-Yayo, Lot 1	1,824,745,684.4	1,824,745,684.4	-
53	Metu By-Pass	682,074,498.7	718,612,515.6	36,538,017
54	Agaro - Gera - Medabo	3,170,122,200.0	3,170,122,200.0	-
55	Mankusa - Birsheleko - 145 Kebele	972,716,279.9	972,716,279.9	-
56	Ambo Town - Guder Town	1,038,722,506.1	1,583,694,763.7	544,972,258
57	Negele Borena-Doloado-Melkasuftu, Lot 1	1,371,325,369.1	1,371,325,369.1	-
58	Gelago-Tewodros Ketema	1,770,605,838.1	1,770,605,838.1	-
59	Awash-Kulbi-Harar Overlay; Contract 1	478,385,156.2	478,385,156.2	-
60	Bonosha - Achamo	682,155,064.2	682,155,064.2	-
61	Gimbi-Guye-Alga - Metu Lot -1:	1,835,358,164.3	1,835,358,164.3	-
62	Jigjiga Bypass	672,098,730.3	672,098,730.3	-
63	Debre Markos-Debre Eliyas-Chagni; Lot 3	2,151,052,000.0	2,151,052,000.0	-
64	Dubti-Arrisa-Adigala-Biyokebob; Lot II	1,482,000,000.0	1,482,000,000.0	-
65	Weyito - Turmi	2,843,185,710.0	2,843,185,710.0	-
66	Dangla - Jawi	2,247,404,541.8	2,247,404,541.8	-
67	Fik - Segeg - Gerbo - Denan; Lot II	1,232,011,537.1	1,232,011,537.1	-
68	Combolcha Town Bypass	806,164,023.7	806,164,023.7	-

Sr. No	Contract Name	Initial contract price (ETB)	Revised Contract Price (ETB)	Cost variation (ETB)
69	Homosha-Hidassie Dam; Lot-1	2,081,401,426.1	2,081,401,426.1	-
70	Dembecha-Feres Bet-Adet ; Contract II	2,578,671,578.7	2,578,671,578.7	-
71	Eliya - Makuye	1,083,400,000.0	1,083,400,000.0	-
72	Gog - Jore - Akobo Contract 1 Lot I	1,497,465,276.2	1,497,465,276.2	-
73	Addis-Gibe River Road Overlay; Lot II	1,465,539,629.1	1,465,539,629.1	-
74	Abomsa - Aseko - Dhibu River	1,651,808,351.2	1,651,808,351.2	-
75	Haro Wenchi - Wenchi	698,574,099.8	698,574,099.8	-
76	Fik - Segeg - Gerbo - Denan ; Lot I:	1,422,968,463.1	1,422,968,463.1	-
77	Abay River Bridge and Approach Lot 2:	825,659,857.6	825,659,857.6	-
78	Bure-Gomer	1,365,798,491.9	1,365,798,491.9	-
79	Akuila-Achagna-Dima Junction Lot III	1,574,746,965.2	1,574,746,965.2	-
80	Jiga - Quarit - Arbgebeya; Contract 1	2,171,037,165.5	2,171,066,618.1	29,453
81	Chanka - Gidami	3,206,772,589.9	3,206,772,589.9	-
82	Dimtu - Bilate Military Training Center	2,375,680,864.5	2,375,680,864.5	-
83	Abomsa - Aseko - Dhibu River	1,651,808,351.2	2,260,899,043.1	609,090,691.92
84	Supe-Darimu-Lalo	2,916,060,200.0	2,916,060,200.0	-
	Total Sum (ETB)	122,894,434,452	125,169,984,119	2,275,549,666
	%age of cost variation vs. total initial contract			**1.85%**

Source: ERA report on performance of local contractors

Total cost increment due to variation is about 2.28 billion, that is on average 1.85% of cost variation vs total initial contract price of the projects that awarded for local contractors from 2018 up to end of 2022. The other major reason for cost overrun is the cost increment related to major construction materials and equipment's, which are stated on most of contract document the price escalation of fuel, bitumen, steel, cement, equipment & the effect of exchange rate incorporated in calculation of price adjustment of monthly interim payment. As a common practice stated on contract document the effect of these items on price adjustment are about 70% the rest 30% considered as fixed cost.

Table 4.5 Average price indices and price escalation Jan-2018 to Dec-2022

Years	Fuel		Bitumen		Steel		Cement		Equipment		US Dollar	
	Average Price indice	price escalation vs base price	Average Price indice	price escalation vs base price	Average Price indice	price escalation vs base price	Average Price indice	price escalation vs base price	Average Price indice	price escalation vs base price	Average Price indice	price escalation vs base price
Base price Jan-18	16.35	0%	160.30	0%	178.00	0%	214.59	0%	245.10	0%	27.78	0%
2019	18.49	13%	219.21	37%	205.12	15%	214.59	0%	262.11	7%	28.91	4%
2020	18.81	15%	160.17	0%	186.93	5%	231.88	8%	266.76	9%	35.53	28%
2021	22.65	39%	230.36	44%	254.68	43%	298.52	39%	278.79	14%	44.00	58%
2022	38.84	138%	330.48	106%	322.76	81%	518.15	141%	307.75	26%	52.52	89%

Source: Price indices collected from project payment certificates

As stated on the table above the average increment calculated as;

The percentage price escalation = (The average rate of on each year-Base price)/base price

Which indicates an average escalation of all items with in previous 5 years is = 97%

The escalation related to the above items=70% of average increment (70%*97%) = 68%

Thus, in previous 5 years ERA spent an average 68% of additional cost by price escalation.

4.2.2 Causes of Cost Overrun

Cost overrun is the second most influencing challenges for successful completion of the road construction projects in in Ethiopia. According to secondary data analysis the five years monthly based and cumulative performance report indicates 1.4% cost variation is observed in projects under progress which are awarded from 2018 up to end of 2022. This is only cost of variation that granted after initial contract amount of the project. However, the expenditure of extra cost is not limited with variation, but also ERA spending more extra costs in connection with price escalation. To analyze causes of time overrun the researcher in his observation and different literatures identified about 10 factors that adversely affecting the cost performance of the project. Subsequently, the survey questionnaire prepared and distributed more than fifteen different projects and with diversified way of distribution addressed professionals from client, supervision team & contractor team those are directly involving on project management activity of the project.

Table 4.6 Causes of cost overrun & their relative importance index

Sr. No	Factors that affected project cost performance	Responded data	
		RII	Rank
1	Price escalation and market instability	0.81	1st
2	Cost variation related error in initial estimation	0.73	2nd
3	Incomplete design data, Design error and late design review	0.72	3rd
4	Poor project management, in planning monitoring and evaluation	0.65	4th
5	Poor project cost management and control system	0.59	5th
6	Lack of properly defined scope	0.57	6th
7	Lack of proper monitoring and controlling on equipment utilization	0.55	7th
8	Poor technical and management skill of Project manager	0.50	8th
9	Failure and rework by the contractor due to quality problem	0.49	9th
10	Corruption and defective works	0.42	10th

Source from questionnaire survey on May 2023

As per the above table, data collected from 40 respondents the top five critical reason for cost overrun are; price escalation and market instability, cost variation related error in initial estimation, incomplete design data, Design error and late design review, poor project management, in planning monitoring and evaluation of the works, Poor project cost management and control system

The first ranked factor for cost overrun is price escalation and market instability, which is the relative importance index (RII) of 0.81. The effects of price escalations on project cost management can increase the costs of the project. Cost escalation occurs when market prices rise. Especially, major construction materials like cement, reinforcement bar, bitumen, fuel. Also, Exchange rate and indices of equipment are considered in price escalation. The second most affecting factor is cost variation related error in initial estimation, which is the relative importance index (RII) of 0.73. An inaccurate estimation of cost within one area of the project also means there is an inaccurate distribution of resources within the project. These will results over or under-allocation of resources, thus affecting productivity. The third most affecting factor is incomplete design data, design error and late design review, which is the relative importance index (RII) of 0.72. Design error and late design review highly affect the project time and cost because it will lead to demolishing and reconstruction. The fourth ranked factor is poor project management, in planning

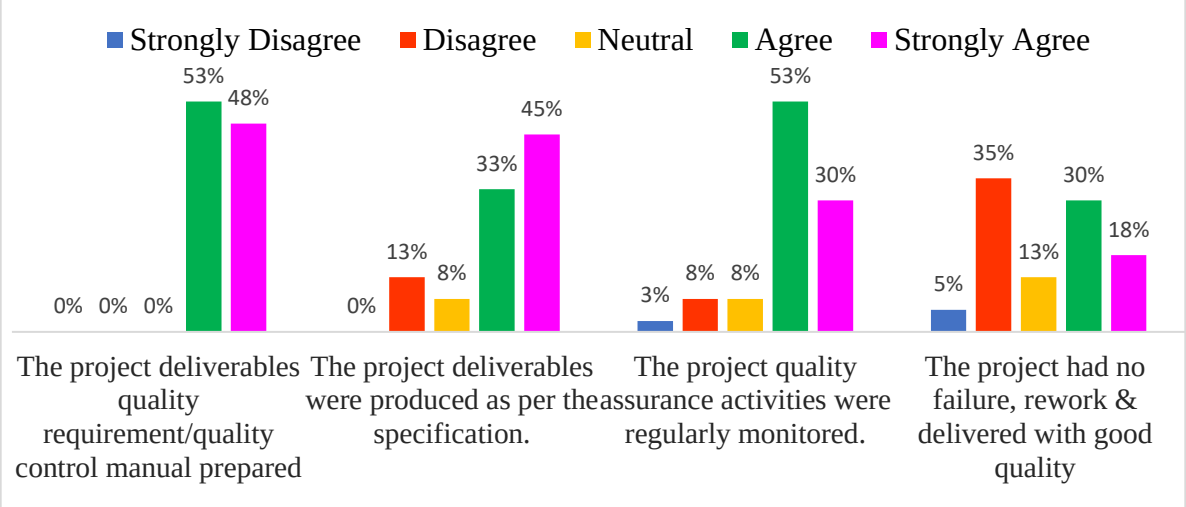
monitoring and evaluation of the works, which is the relative importance index (RII) of 0.65. The project management is the common and can affect the all aspects of the project objective. Accordingly, poor project management does highly affect the project cost, quality & time. The fifth ranked factor is Poor project cost management and control system, which is the relative importance index (RII) of 0.59.

As Yenealem F (2020) prevailed in his previous study the top five factors for cost overrun are; Inflation of material cost, Scope change with change order, Incomplete study to before project approval, Poor specification/or bill of quantity and design, Poor project performance monitoring. In correlating the studies Price escalation and market instability is set the 1st ranked in this study and 1rd ranked in the above literature. So, it can take as critical factor and in addition this can be justify by data based on indices of material price. In this study the second ranked is cost variation related error in initial estimation, Yenealem F (2020) in the fourth rank set poor specification/or bill of quantity and design, which means quantifying and pricing the bill item is the base of cost estimation. Incomplete design data, Design error and late design review is the third ranked in both studies. Poor project management, in planning monitoring and evaluation of the works is 4th ranked in this study and 5th ranked as per Yenealem F (2020)

4.3 Project Quality Management

This section presented, discussed and analyzed quality management practice, quality problem and reason for quality related defect in Ethiopian Road construction projects that undertaken by domestic contractors. To identify and analyze the level of practice on project quality management the primary data collected from 40 respondents regarding to development of quality control manual, deliverable quality, monitoring, quality controlling, & quality assurance. Thus, the data presented, as shown in the graph below.

Figure 4.9 Level of project quality management practice



Source from questionnaire survey on May 2023

As shown on the table above 40 respondents were asked about the level of practice on Project Quality Management, and on average they responded 2% Strongly Disagree, 14% Disagree, 7% Neutral, 42% Agree, 35% Strongly Agree, which is relative importance index (RII) of 0.79. Thus, the quality management practice in 2 % of projects has poor quality management, 14 % Low level, 7 % medium level, 42 % of projects good & 35 % very good quality management.

4.3.1 Project quality problems

The quality management in Ethiopian road construction industries shows better performance than time and cost performance this is because of ERA specifications and quality control system. Nevertheless, in physical observation some projects failed in relation to defective work or due to under quality construction. This quality problem exposed the project to failure and rework, also its effect caused extra time, cost even scope change. It is clear the observation of defective work and failure related to quality problem in some projects. When trying to collect the reliable data on the area, either the companies are not cooperative to provide quality related data or the project staffs are not voluntary to disclosure the project quality related issues.

4.3.2 Causes of Quality Problems

To identify and analyze the causes of project quality problem the primary data collected from 40 respondents presented, analyzed and discussed as follows.

Table 4.7 Causes for project quality problem and their relative importance index

Sr. No	Factors that affected project quality performance	Response data	
		RII	Rank
1	Poor project management, in planning monitoring and evaluation	0.65	1st
2	Lack of proper monitoring and controlling on material utilization	0.59	2nd
3	Lack of experience & skill in supervision and design team	0.58	3rd
4	Lack of training and capacity building of project team	0.52	4th
5	The effect of poor environmental impact management at construction site	0.51	5th
6	Poor quality control system	0.51	6th
7	Poor technical and management skill of Project manager	0.50	7th
8	Poor qualification of the contractor's technical staff	0.49	8th
9	Failure and rework by the contractor due to quality problem	0.49	9th
10	Inadequate contractor experience in the industry	0.47	10th
11	Corruption and defective works	0.42	11th

Source from questionnaire survey on May 2023

As per the above table, data collected from 40 respondents the top five critical reason for quality related problems are; Poor project management, in planning monitoring and evaluation of the works, Lack of proper monitoring and controlling on material utilization, Lack of experience & skill in supervision and design team, Lack of training and capacity building of project team, The effect of poor environmental impact management at construction site

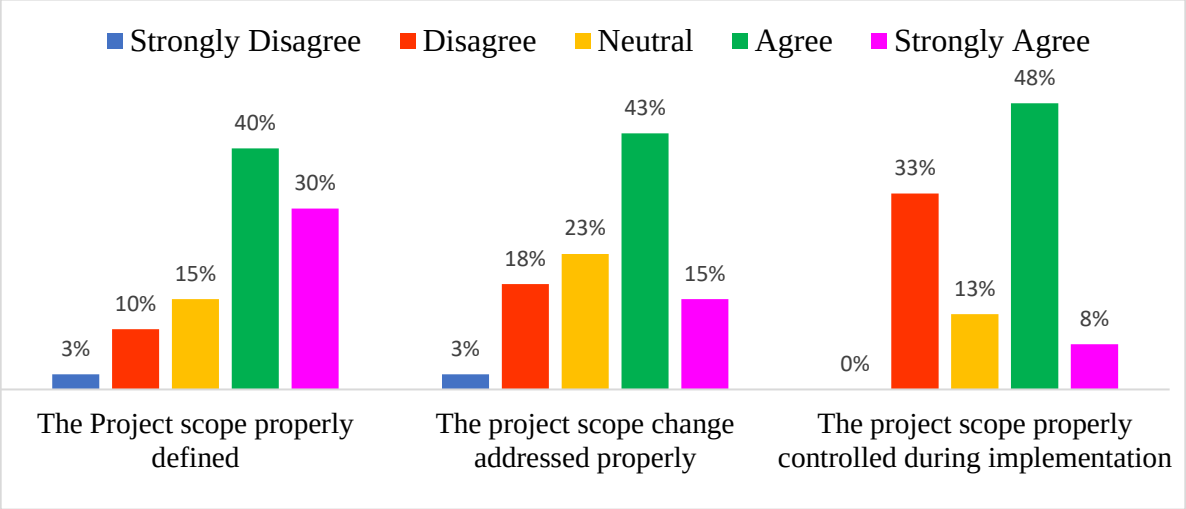
The first ranked factor for quality related problem is poor project management, in planning monitoring and evaluation of the works, which is the relative importance index (RII) of 0.65. The practice of project quality management is better than other knowledge areas, however the project quality does affect if the project activity implement merely without plan, evaluation and controlling. The second most affecting factor is Lack of proper monitoring and controlling on material utilization, which is the relative importance index (RII) of 0.59. The third most affecting factor is Lack of experience & skill in supervision

and design team, which is the relative importance index (RII) of 0.58. The fourth ranked factor is lack of training and capacity building of project team, which is the relative importance index (RII) of 0.52. The fifth ranked factor is the effect of poor environmental impact management at construction site, which is the relative importance index (RII) of 0.51.

4.4 Project Scope Management

This section presented, discussed, and analyzed scope management practice, scope change and reason for scope change in Ethiopian Road construction projects that undertaken by domestic contractors. To identify and analyze the level of practice on project scope management the primary data collected from 40 respondents regarding to scope defining, addressing scope change & controlling scope change. Thus, the data presented, as shown in the graph below

Figure 4.10 Level of project scope management practice



Source from questionnaire survey on May 2023

As shown on the table above 40 respondents were asked about the level of practice on Project Scope Management, and on average they responded 2% Strongly Disagree, 20% Disagree, 17% Neutral, 43% Agree, 18% Strongly Agree, which is relative importance index (RII) of 0.71. Thus, the scope management practice in 2 % of projects has poor scope management, 20 % Low level, 17 % medium level, 43 % of projects good & only 18 % very good scope management.

4.4.1 Scope Change and its Cause

The cause of scope change is mainly dependent on the above three constraints. Based on the secondary data sourced from ERA shows out of the above 84 projects about 15 projects granted both time extension and cost variation simultaneously. In this regard some of the letters reviewed as reference to identify the reason behind. Accordingly, most of the reason for variation order and time extensions are; late design change & specification revision of the projects. In the same way this caused the scope change of the projects. Standing from the concept is as shown in iron triangle, the deep interrelation between time, cost, quality & scope, the change in any of the three constraints will affect the scope of the project.

CHAPTER FIVE

5. SUMMERY, CONCLUTION AND RECOMMENDATION

5.1 Summary of Major Findings

In this chapter summarized the research findings based on the studies that have been carried out on the Project management techniques used by local contractors in the Ethiopian road construction industry. The study tried to identify the level of project management practice in Ethiopia construction projects based on the area of time management, cost management, quality management & scope management. In addition to identify and rank the main causes for time overrun, cost overrun, poor quality & scope change. Mainly this study focused the three main areas of project management, because of all the problem will affect the performance of these four constraints; time, cost, quality & scope. The analysis has been carried out by collecting the data of currently ongoing projects and the projects that had completed in the last five years period of time. According to the collected data through structured interview questionnaire, data from different literatures, and the secondary data that collected from ERA source & contractor's source. After the collected data properly processed, analyzed & the study revealed the following results.

By considering the objective of the study the first part is identified the level of practice in project management especially time, cost, and quality and scope. According to the primary data that collected from about 40 respondents Project Quality Management & Project Scope Management are found on the level of acceptable practice with relative importance index (RII) of 0.79 & 0.71 respectively. Project Cost Management & Project Time Managements are found at low level of practice with relative importance index (RII) 0.57 & 0.51 respectively.

Project time management; Based on analysis of primary data on project time management practice; 18 % of projects has poor time management, 43 % Low level, 11 % medium level, 23 % of projects good & only 6 % very good time management. Which described with average relative importance index (RII) of 0.51.

Time overrun; according to secondary data sourced from ERA report of local contractor performance which including 84 projects and the finding from the data shows almost all 100% of projects are found behind the schedule, which is minimum 5% lag and maximum 88% lag observed and the average time overrun of the projects are about 38% higher than the planned period of time.

Causes of time overrun; the top critical reason for time overrun are; thus, the top five major findings are ranked as; delay RoW obstruction and compensation payment by the client, delayed change orders (Additional work, design & specifications change), delay decision making by client pending issues related to contract and other, incomplete design data or design error and late design review & unforeseen weather condition. Which described with the relative importance index (RII) 0.91, 0.79, 0.77, 0.72,0.7 respectively. The next critical causes of time overrun that ranked from 6th up to 10th are; unrealistic contract duration and requirements imposed on the contract, shortage of Construction material in the market, delay in supply of construction material by the contractor, shortage of spare parts and extended breakdown time of equipment's & contractors' difficulties in financing the project during construction. Which described with the relative importance index (RII) of 0.70, 0.67, 0.67, 0.67 & 0.67 respectively.

Project cost management; based on analysis of primary data on project cost management practice; 8 % of projects has poor cost management, 39 % Low level, 16 % medium level, 28 % of projects good & only 8 % very good cost management. Which described with average relative importance index (RII) of 0.57.

Cost overrun; according to the ERA report the analysis shows total 2.28 billion ETB or 1.85% cost overrun shown due to design change & new change orders. The other and the critical reason for cost overrun is cost of price escalation. In previous 5 years ERA spent on average 68% of additional cost for price adjustment related to price escalation.

Causes of cost overrun; the top critical reason for time overrun are; thus, the top five major findings are ranked as; price escalation and market instability, cost variation related to error in initial estimation, incomplete design data or design error and late design review, poor project management in planning monitoring and evaluation of the works & poor

project cost management and control system. Which described with relative importance index (RII) 0.81, 0.73, 0.72, 0.65,0.59 respectively.

Project quality management; based on analysis of primary data on project quality management practice; 2 % of projects has poor quality management, 14 % Low level, 7 % medium level, 42 % of projects good & 35 % very good quality management. Which described with average relative importance index (RII) of 0.79.

Project quality problem; the quality management in Ethiopian road construction industries shows better performance than time and cost performance this is because of ERA specifications and quality control system. Nevertheless, in physical observation some projects failed in relation to defective work or due to under quality construction. This quality problem exposed the project to failure and rework, also its effect caused extra time, cost even scope change. Most observed quality problem is drainage structure blockage and road failure in relation to poor waste management.

Causes of quality problems; the study identified the major reason for quality related problems are; poor project management, in planning monitoring and evaluation of the works, lack of proper monitoring and controlling on material utilization, lack of experience & skill in supervision and design team, lack of training and capacity building of project team & the effect of poor environmental impact management at construction site. Which described with relative importance index (RII) 0.81, 0.73, 0.72, 0.65,0.59 respectively.

Project scope management; based on analysis of primary data on project scope management practice; 2 % of projects has poor scope management, 20 % Low level, 17 % medium level, 43 % of projects good & only 18 % very good scope management. Which described with average relative importance index (RII) of 0.71.

Project scope change; according to secondary data sourced from ERA report of local contractor performance out of 84 projects about 15 projects granted both time extension and cost variation simultaneously in relation to the effect of significant design change. In this relation about 18% of projects have shown scope change.

Causes of scope change; the study identified that the major reason for scope change is, the deep interrelation between time, cost, quality & scope, the change in either of the three constraints will affect the other and based on the above 15 projects the simultaneous change on time and cost are the main cause of scope change.

5.2 Conclusions

Based on the results of primary and secondary data analysis, following conclusions were drawn. The level of practice on project management indicates project time management & cost management are found at low level of practice in Ethiopian road construction projects. However, project quality and scope management found at medium to acceptable level of practice. That means on average about 75% of contractors have acceptable practice of quality and scope management, but only 52% of contractors have acceptable level of time and cost management.

The project time and cost overruns are extreme challenges for Federal Road construction projects in the country. As per the data 84 road projects in included in the study for their time and cost performance. Those projects are the projects that awarded from the beginning of 2018 up to 2022 for local contractors. Accordingly, almost 100% of the projects found behind the schedule & an average time overrun is about 38%.

The major reason for this time overrun are; the primary three reasons are client (ERA) or government related issues those are Delay RoW obstruction and compensation payment by the Client, Delayed change orders (Additional work, design & specifications change), Delay decision making by client pending issues related to contract and other. The next reason fourth ranked are related to design or supervision companies i.e., incomplete design data, design error and late design review. The fifth is related to global weather change and i.e., the impact of unforeseen weather condition. The next 6th up to 10th ranked are; unrealistic contract duration and requirements imposed on the contract, shortage of Construction material in the market, delay in supply of construction material by the contractor, shortage of spare parts and extended breakdown time of equipment's & contractors' difficulties in financing the project during construction are related to ERA time schedule, market condition and poor construction project management system of

contractor.

When we see the cost of the project, it is to be evaluated in two ways; those are the first is the cost of variation due to scope change or new change orders additional granted cost variation is 2.28 billion ETB or 1.85% of initial contract amount. The other and the critical reason for cost overrun or reason for over budget is cost of price adjustment related to price escalation of major construction materials cement & reinforcement bar, bitumen, fuel, equipment and exchange rate. In previous 5 years ERA spent on average 68% of additional cost for price adjustment related to price escalation of the aforementioned items.

The top critical reason for cost overrun is; price escalation and market instability which are sourced from the current market price inflation related to the decline of country economy. The next reason is client related or designer related problem that are cost variation due to error in initial estimation, it arises from lack of detail design and error in estimation of BOQ. Incomplete design data, design error and late design review are sourced form inexperienced and un skilled design team. The next 4th & 5th causes of cost overrun are related to the contractors and consultant cost management system, which are poor project management, in planning monitoring and evaluation of the works, Poor project cost management and control system.

The quality management in Ethiopian road construction industries shows better performance than time and cost performance this is because of ERA specifications and quality control system. Nevertheless, in physical observation some projects failed in relation to defective work or due to under quality construction. This quality problem exposed the project to failure and rework, also its effect caused extra time, cost even scope change. In this regard the study identified the major reason for quality related problems are; Poor project management, in planning monitoring and evaluation of the works, lack of proper monitoring and controlling on material utilization, lack of experience & skill in supervision and design team, lack of training and capacity building of project team & the effect of poor environmental impact management at construction site.

As aforementioned in the first and second position the main reason of quality problem is related to project manager and his team, because they are the primary persons in

controlling the quality during implementation. The third reason is directly related to consulting or supervision companies which are in relation to hiring or assigning unqualified or inexperienced professionals for supervision and quality controlling. The fourth reason is in relation to the company's poor perception on training and capacity building of their employees. This exposes the employee to knowledge deficit and lack of awareness on the consequence of quality problem that causing limitation on understanding the impact of quality problem on time performance, cost performance even on scope of the project. As shown in the fifth rank, most of the road construction companies in Ethiopia has the practice of poor environmental impact protection. Based on site observation and the respondents in open ended question described that during earth work construction the excavated spoil material mainly waste at vicinity of the road. In most road projects this type of problem caused two effects. The first is the main road crack and failure due to the traction force caused by unbalanced mass at the approach of the road & the second effect is the movement of the mass towards the drainage structures due to the flood during the rainy season, which resulted in silt up and obstruction of drainage systems.

The cause of scope change is dependent on other constraints and it is cause due to either of time variation, cost variation and change on deliverables quality. Standing from the concept is as shown in iron triangle, the deep interrelation between time, cost & quality will cause the change in any of the three constraints will affect the other and this will cause the scope change of the project. In the aforementioned list of projects about 14 projects granted both time extension and cost variation simultaneously in relation to the effect of significant design change. Which indicates about 17% of projects has shown scope change.

5.3 Recommendations

As per the objective of the study the finding on project management practice and factors that affecting performance of the project identified and concluded. Those are based on the existing practice project time and cost management found at low level implementation and quality and scope are found at medium to acceptable level of practice in Federal Road construction projects. In addition, time and cost overrun of the road construction projects are the major critical problems in the country. The other quality problems & scope change

are common problems in the country due to various and complex reasons in relation to project management technique and skills, social, cultural, economic, political, natural and other different factors. Based on the finding the following recommendation forwarded as remedial measure for future improvement of the project management practice.

i. To improve decision making process from the client/ government side

The most critical and top ranked reason of time overrun and cost overrun are delay of decision-making process by client or government. The problems like delay right of way compensation payment and late removal of obstructions, Delayed change orders (Additional work, design & specifications change), late decision-making process by con contract related pending issues needs the decision of client. Hence to resolve these problems the client should Plan and allocate adequate budget for RoW compensation payment. Communicate and persuade all concerning parties and stakeholders on reliability and seriousness of right of way for construction projects. The client should have to improve the decision-making process & shall make clear and fast decision to avoid the project delay in relation to pending issues.

ii. Train and make capable project managers and project team

The project managers and project management team should have better knowledge on the area of project management. Because of the major and the source of all problems are unskilled and traditional ways of management. The traditional way of project management is common in most of Ethiopian construction companies and it is mostly dominated with trend practice contrary to agile project management system. This is mainly observed especially on time, cost & quality management of the project. Despite, most of the projects preparing time schedule, cost plan & quality control manual, but the implementation or execution of each activity have been carrying out without adherence of the schedule. In addition, there has poor cost and quality controlling mechanism during implementation. These problems are either knowledge deficit, lack of awareness or negligence. Hence, to resolve these problems as remedial measure the forwarded recommendations are; train the workers and evaluate their performance, motivate good performed by rewarding and train staffs who are less performed or less efficient.

iii. To improve construction companies' / contractors' project management system

One of the problems for poor practice and project failure is the capacity level of the companies which is their system of management especially on financial and resource related management. These are the companies to avoid the practice of improper utilization of advance payment and allocate adequate budget for project work to enhance the implementation of the project by avoiding financial difficulty. As per the project schedule to conduct procurement process, mobilize resources like material and equipment based on the plan. Hire all the relevant project team and assign skilled and experienced project manager, management and technical staffs. The functional staff should involve, activity participate, and support the project team on all aspects of the project management process.

iv. To improve the capacity of design and supervision companies

The other critical project challenges in relation to time cost quality and scope are directly related to incomplete and poor design, late design change, poor monitoring and controlling of the project. To improve these problems the companies should hire and assign skilled and experienced professionals, train and improve the knowledge of staff on design and supervision. In addition, the employer should involve and strictly follow up, evaluate the performance of design and supervision staff.

5.4 Areas of further study

This study tried to address limited area of project management, to address all area of project management it is advisable address all knowledge area of the project management. In addition, it is advisable to conduct detail study in resource management that included Human resource management, Material management & Equipment management, because of the major problems arising from contractors' side are the problem of resource management.

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APPENDIX A

Structured interview

Part I: Your Personal Information

Instruction: Please indicate your answer just tick/Click your selection the box in front of your choice. If you have answer out of the alternatives provided, please specify in the blank space given

1. Your sex?
   - Male
   - Female
2. Your age?
   - < 20 years
   - 20 – 30 years
   - 30 – 40 years
   - 40 – 50 years
   - 50 – 60 years
   - 60 and above
3. Level of your education?
   - 10/12 complete
   - 10+3
   - Diploma
   - 1st Degree
   - Masters and above
4. How many years of experience do you have?
   - Less than 1 year
   - 1-5 years
   - 5-10 years
   - 10-15 years
   - 15-20 years
   - 20 years and above
5. Your responsibility on the project is?
   - ERA team (Team leader, Counterpart, Project Engineer & other Expert)
   - Resident Engineer
   - Ass. Resident Engineer
   - Other key staff of consultant
   - Project Manager
   - Construction Engineer
   - Office Engineer
   - Material Engineer
   - Contractor's Other key staff
6. Your qualification or field of specialization?

   _____
7. Please would you state the project name here?

   _____

Part II: Questions related to actual practices of project management

Instruction: items in the table asks level of your agreement regarding 'how project management process and project management area of knowledge was practiced for the project you have recently completed or ongoing project &; accordingly, for each question select your choice by marking or tick in the box

I	**Project Time Management**	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.1	The project time schedule was properly developed.					
2.2	The project activity implemented as per the scheduled time					
2.3	The project progress was properly monitored and controlled regarding to planned time					
2.4	The progress/completion of the project kept on time /no time over run					
II	**Project Cost Management**					
3.1	The project cost was properly estimated.					
3.2	The project budget provides timely and update regularly					
3.3	The project cost properly monitored and controlled					
3.4	The project cost kept under the budget/ no cost overrun					
III	**Project Quality Management**					
4.1	The project deliverables quality requirement/quality control manual prepared					
4.2	The project deliverables were produced as per the specification.					
4.3	The project quality assurance activities were regularly monitored.					
4.4	The project had no failure, rework & delivered with good quality					
IV	**Project Scope Management**					
1.1	The Project scope properly defined					
1.2	The project scope change addressed properly					
1.3	The project scope properly controlled during implementation					

Any other project management practice related to the project success, please indicate below:

_____

Part III: Questions related to challenges faced during the project management practices

Instruction: in this section you are requested to rate the intensity of challenges that affected project performance while managing the project;

Sr. no	Challenges that affected project performance	Very low effect	Low effect	Moderate effect	High effect	Very high effect
1	Lack of properly defined scope					
2	Delayed change orders (Additional work, design & specifications change)					
3	Delayed handover of project by client to contractor					
4	Delayed commencement of the project by contractor					
5	Lack of proper plan and schedule by contractor					
6	Delay RoW obstruction and compensation payment by the Client					
7	Effect of Social, Cultural and religious related non working days					
8	Delay in approval of site works and interim payment certificates by the consultant					
9	Financial problems (delayed payments for completed work, financial difficulties,)					
10	unrealistic contract duration and requirements imposed on the contract					
11	Incomplete design data, Design error and late design review					
12	Delay in design documents preparation drawing & data approval by consultant					
13	Unforeseen weather condition					
14	Delay decision making process by client pending issues related to contract and other					
15	Poor project management ,in planning monitoring and evaluation of the works periodically					
16	Contractors difficulties in financing the project during construction					
17	Cost variation related error in initial estimation					
18	Price escalation and market instability					
19	Improper utilization of advance payment by company					
20	Poor project cost management and control system					
21	Inadequate contractor experience in the industry					
22	Poor quality control system					
23	Failure and rework by the contractor due to quality problem during construction					
24	Corruption and defective works					

Sr. no	Challenges that affected project performance	Very low effect	Low effect	Moderate effect	High effect	Very high effect
25	Poor communication and coordination of the Contractor with other stakeholders					
26	Lack of effective communication & Coordination between project team					
27	Poor risk management system					
28	In Security or war in the project area					
29	Poor technical and management skill of Project manager					
30	Poor qualification of the contractor's technical staff					
31	Lack of experience & skill in supervision and design team					
32	Lack of motivation and commitment of project team					
33	Shortage of labour					
34	Lack of training and capacity building of project team					
35	Delayed procurement and poor supply chain					
36	Lack of hard currency for procurement					
37	Poor logistic management system & supply system					
38	Delay in mobilization of construction Equipment's by the contractor					
39	Shortage of construction machinery at project					
40	Lack of proper monitoring and controlling on equipment utilization					
41	Shortage of spare parts and extended breakdown time of equipment's					
42	Delay in supply of construction material by the contractor					
43	Shortage of Construction material in the market					
44	Lack of proper monitoring and controlling on material utilization					
45	Scarcity of local construction materials at project site (E.g. Quarry, sand…)					
46	Poor management system of environmental impact at construction site affected the quality of construction					
47	Poor management system of road traffic at construction site affected effectiveness of construction implementation					
48	Poor management system of workers health and safety at construction site affected workers performance					

Monthly price indices

Months	Fuel		Bitumen		Steel		Cement		Equipment		US Dollar	
	Monthly Price indice	price escalation vs base price	Monthly Price indice	price escalation vs base price	Monthly Price indice	price escalation vs base price	Monthly Price indice	price escalation vs base price	Monthly Price indice	price escalation vs base price	Monthly Price indice	price escalation vs base price
Jan-18	16.35	0%	160.30	0%	178.00	0%	214.59	0%	245.10	0%	27.78	0%
Jan-19	17.78	9%	207.70	30%	218.50	23%	214.59	0%	260.60	6%	27.78	0%
Feb-19	18.03	10%	201.20	26%	217.00	22%	214.59	0%	261.00	6%	27.78	0%
Mar-19	18.03	10%	211.50	32%	216.10	21%	214.59	0%	261.00	6%	27.78	0%
Apr-19	18.03	10%	236.80	48%	216.70	22%	214.59	0%	261.20	7%	27.78	0%
May-19	18.75	15%	226.30	41%	213.70	20%	214.59	0%	261.60	7%	27.78	0%
Jun-19	18.75	15%	234.30	46%	211.20	19%	214.59	0%	261.70	7%	27.78	0%
Jul-19	18.75	15%	255.10	59%	202.40	14%	214.59	0%	261.80	7%	29.51	6%
Aug-19	18.75	15%	245.80	53%	199.10	12%	214.59	0%	261.90	7%	29.62	7%
Sep-19	18.75	15%	228.00	42%	197.90	11%	214.59	0%	263.20	7%	29.74	7%
Oct-19	18.75	15%	213.20	33%	193.10	8%	214.59	0%	263.10	7%	29.88	8%
Nov-19	18.75	15%	200.00	25%	189.60	7%	214.59	0%	263.90	8%	30.03	8%
Dec-19	18.75	15%	170.60	6%	186.10	5%	214.59	0%	264.30	8%	31.43	13%
Jan-20	18.75	15%	193.00	20%	188.90	6%	214.59	0%	266.20	9%	32.48	17%
Feb-20	18.75	15%	196.50	23%	188.30	6%	233.45	9%	266.60	9%	32.70	18%
Mar-20	18.75	15%	191.80	20%	191.10	7%	233.45	9%	266.60	9%	32.95	19%
Apr-20	18.75	15%	147.90	-8%	191.40	8%	233.45	9%	266.80	9%	33.538	21%
May-20	18.75	15%	129.00	-20%	188.80	6%	233.45	9%	266.80	9%	34.21	23%
Jun-20	18.75	15%	140.60	-12%	185.90	4%	233.45	9%	266.80	9%	34.90	26%
Jul-20	18.75	15%	157.40	-2%	185.90	4%	233.45	9%	266.70	9%	35.72	29%
Aug-20	18.75	15%	165.70	3%	183.60	3%	233.45	9%	266.70	9%	36.00	30%
Sep-20	18.75	15%	162.40	1%	181.20	2%	233.45	9%	266.70	9%	37.00	33%
Oct-20	18.75	15%	145.50	-9%	182.70	3%	233.45	9%	266.90	9%	37.56	35%
Nov-20	19.09	17%	145.30	-9%	186.60	5%	233.45	9%	266.90	9%	38.32	38%
Dec-20	19.09	17%	146.90	-8%	188.70	6%	233.45	9%	267.40	9%	38.96	40%
Jan-21	19.09	17%	162.60	1%	197.50	11%	233.45	9%	271.30	11%	39.98	44%
Feb-21	21.03	29%	198.20	24%	215.90	21%	233.45	9%	271.90	11%	40.25	45%
Mar-21	23.04	41%	207.90	30%	228.00	28%	233.45	9%	272.20	11%	40.89	47%
Apr-21	23.18	42%	240.50	50%	233.00	31%	233.45	9%	272.40	11%	42.20	52%
May-21	23.18	42%	215.50	34%	244.40	37%	299.47	40%	273.60	12%	42.85	54%
Jun-21	23.18	42%	232.90	45%	215.90	21%	299.47	40%	277.00	13%	44.00	58%
Jul-21	23.18	42%	246.70	54%	266.34	50%	299.47	40%	277.36	13%	44.62	61%
Aug-21	23.18	42%	250.94	57%	281.95	58%	350.00	63%	278.26	14%	44.62	61%
Sep-21	23.18	42%	248.54	55%	288.41	62%	350.00	63%	279.55	14%	47.13	70%
Oct-21	23.18	42%	245.05	53%	290.70	63%	350.00	63%	289.05	18%	47.13	70%
Nov-21	23.18	42%	264.98	65%	295.88	66%	350.00	63%	290.33	18%	47.13	70%
Dec-21	23.18	42%	250.55	56%	298.14	67%	350.00	63%	292.56	19%	47.13	70%
Jan-22	28.94	77%	251.27	57%	315.03	77%	410.55	91%	293.52	20%	49.71	79%
Feb-22	28.94	77%	272.01	70%	314.31	77%	410.55	91%	293.69	20%	50.79	83%
Mar-22	28.94	77%	289.44	81%	318.79	79%	433.68	102%	294.22	20%	51.81	86%
Apr-22	28.94	77%	335.21	109%	323.17	82%	462.30	115%	302.83	24%	52.03	87%
May-22	28.94	77%	386.78	141%	337.55	90%	433.68	102%	304.70	24%	52.43	89%
Jun-22	35.43	117%	411.71	157%	340.52	91%	496.80	132%	305.90	25%	52.64	89%
Jul-22	35.43	117%	425.06	165%	339.64	91%	599.50	179%	308.25	26%	53.04	91%
Aug-22	35.43	117%	403.85	152%	331.56	86%	599.50	179%	316.72	29%	53.04	91%
Sep-22	35.43	117%	358.69	124%	323.41	82%	599.50	179%	317.62	30%	53.04	91%
Oct-22	59.90	266%	332.14	107%	319.09	79%	590.59	175%	317.64	30%	53.66	93%
Nov-22	59.90	266%	308.04	92%	309.17	74%	590.59	175%	318.94	30%	53.95	94%
Dec-22	59.90	266%	191.57	20%	300.84	69%	590.59	175%	319.02	30%	54.14	95%