

**SCHOOL OF GRADUATE STUDIES**

**DEPARTMENT OF CONSTRUCTION TECHNOLOGY & MANAGEMENT**

**ASSESSMENT ON ROAD CONSTRUCTION PROJECT PERFORMANCE IN  
ETHIOPIAN ROADS ADMINISTRATION [THE CASE OF BAHIRDAR–TISESAT  
DESIGN AND BUILD ROAD PROJECT].**

**BY:**

**ARSEMA WORKAGEGN**

**ADVISOR:**

**BIRUK TIBEBU (PhD cand.)**

A THESIS SUBMITTED TO ADDIS COLLEGE UNIVERSITY, SCHOOL OF GRADUATE  
STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER IN CONSTRUCTION TECHNOLOGY & MANAGEMENT

**NOVEMBER, 2024 GC  
ADDIS ABABA, ETHIOPIA**

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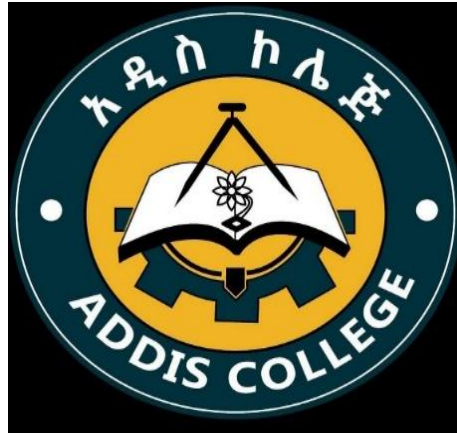
## DECLARATION

I hereby declare that this thesis report, entitled “Assessment on Road Construction Project Performance in Ethiopian Roads Administration: The Case of Bahirdar–Tisesat Design and Build Road Project,” has been submitted by me to the School of Graduate Studies, Department of Construction Technology & Management, Addis College University. This is my original work, and it has not been submitted to any other university or institution for the award of any degree, diploma, or certificate, nor has it been published at any time before.

Arsema Workagegn .....  
Signature Date

As Thesis Advisor, I hereby certify that I have read and evaluated the thesis prepared under my guidance by Arsema Workagegn, entitled “Assessment on Road Construction Project Performance in Ethiopian Roads Administration: The Case of Bahirdar–Tisesat Design and Build Road Project.” I recommend that it be accepted as fulfilling the requirements for the Degree of Master of Science in Construction Technology & Management.

Advisor: Biruk Tibebu .....  
Signature Date



## SCHOOL OF POST GRADUATE STUDIES

### THESIS APPROVAL FORM

This is to certify that the thesis entitled “Assessment on Road Construction Project Performance in Ethiopian Roads Administration: The Case of Bahirdar–Tisesat Design and Build Road Project,” is carried out by Arsema Workagegn Aleme MSc student at Addis College, with ID Number CMGSR/266/2014

_____	_____	_____
Name of External Examiner	Signature	Date
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Name of Internal Examiner	Signature	Date
_____	_____	_____
Name of chairman	Signature	Date
_____	_____	_____
Name of school dean	Signature	Date

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## ABSTRACT

*This study evaluates the performance of road construction projects managed by the Ethiopian Roads Administration, focusing specifically on the Bahir Dar-Tisesat design and build road project. The study aims to offer actionable insights to enhance road construction project performance and ensure successful project outcomes. The research examines critical factors impacting project performance, particularly time, cost, and quality, using a comprehensive analysis facilitated by SPSS software. The findings reveal that cost is the most significant factor affecting project outcomes, with a combined Relative Importance Index (RII) of 0.697619. Time follows closely with a combined RII of 0.680376, highlighting delays in mobilization and procurement as major issues. Quality, though ranked third with a combined RII of 0.646759, remains essential for maintaining construction standards. Financial constraints, such as cash flow problems, were identified as significant contributors to project delays and cost overruns. The study emphasizes the need for improved financial planning, monitoring, and effective scheduling, alongside enhanced site management and rigorous quality control measures. Additionally, it recommends further research into the effects of external factors and the evaluation of different management strategies to address project challenges.*

***Keywords: Road construction, Project performance, cost, time, quality, financial constraints***

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## **ABBREVIATIONS/ACRONYMS**

CPI	Cost Performance Index
CPM	Critical Path Method
ERA	Ethiopian Road Administration
GDP	Gross Domestic Product
KPIs	Key Performance Indicators
QC	Quality Control
QA	Quality Assurance
QP	Quality Planning
RII	Relative Importance Index
SPSS	Statistical Package for the Social Sciences
TQM	Total Quality Management
UK	United Kingdom

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background of the study

The construction industry is one of the key economic initiatives that develop the economy of any country. That being said, the results of building and road construction projects serve as a measure of a country's degree of development (Ayele, 2020). The construction industry, which controls the local economy, is growing as one of the key areas in the global economy. The construction industry contributes about 8% of the world's GDP (Henok Asrat & Mohamed, 2020). This shows the degree to which the international economy depends on the construction industry.

In Ethiopia, projects to construct roads are a means to accomplish development goals. Successful road projects enable development methods that include increasing rural areas' accessibility, reducing transportation maintenance costs, and creating more space for development activities. Road improvements, which require a significant amount of capital, also boost the economy overall by creating jobs and having a positive impact on other types of businesses (Weldegebriel, 2018)

The government, with assistance from other governments or the private sector, built roads as an essential aspect of infrastructure to enable people to move products and people securely between locations in vehicles and on foot.

If the construction of a road satisfies the needs of the client and stakeholders in terms of schedule, cost, and quality, it is considered a complete success. An efficient evaluation of time and cost performance must be present and given the attention it deserves in order to meet these goals. If not, risk can take many different forms and lead to a number of failures, including delays, overspending, deaths, damage to the environment, and material costs (Henok Asrat & Mohamed, 2020).

Many issues with project performance and target deviations are common in the road building industry. The following are only a few of the many performance issues that the industry has faced over several decades: lack of coordination and communication, poor quality, safety issues, delays, cost overruns, and unsatisfactory local support. These demonstrate that, although

performance measurement is one of the most crucial elements for identifying and fixing performance issues, it has received very little attention in its implementation (Adam et al., 2014). The triple project constraints cost, time, and quality are used to assess a project's success and performance. Completed on time within cost and quality standards is the benchmark for measuring project success. The industry necessitates increased funding and expenses due to the abundance of project activities, tasks, and limits. According to (Dachasa, 2022), delays in terms of cost, time, safety, and quality affect the success of a project. The consequences of delays affect not just our construction sector but also the economy of the whole country.

Thus, the primary focus of this study was the assessment of the Ethiopian Roads Administration's performance measuring process for the Bahirdar-Tisesat design and build road project. In general, assessments of the methods used now for measuring performance were carried out. Performance parameters have established recent construction project methods based on data collected from locations and organizations. For the road building project, the necessary performance indicators were obtained. To provide a complete and effective approach to performance evaluation, a comprehensive framework for measuring performance has been introduced over time.

## **1.2. Statement of problem**

Road construction projects are crucial for infrastructure development and economic growth, especially in Ethiopia. However, the Ethiopian Roads Administration (ERA) faces significant challenges—both internal and external—that hinder the performance of the road infrastructure sector. These challenges, including security issues, shortages of construction materials, and concerns about time, cost, quality, and adherence to standards, have disrupted construction processes and negatively impacted project outcomes.

In response, 27 project coordination offices were established to oversee road projects during the construction phase and address management inefficiencies. The Bahir Dar Project Management Office manages 12 road projects, many of which have faced delays in meeting their scheduled completion dates. Several projects have been suspended or terminated due to construction-related challenges.

The Bahir Dar-Tisesat design and build road project, managed by ERA under the Bahir Dar Project Management Office, is a key investment aimed at enhancing transportation connectivity and regional development. Despite its significance, there is a lack of comprehensive studies evaluating the overall performance of the project.

Key issues—such as construction quality, adherence to timelines, cost management, environmental impacts, and socio-economic benefits to local communities—require further examination. Analyzing these aspects is crucial to understanding the project's strengths, weaknesses, opportunities, and threats.

Moreover, the effectiveness of project management strategies used by ERA to oversee the Bahir Dar-Tisesat project needs to be critically assessed to understand their influence on project delivery and stakeholder satisfaction.

Initially scheduled for completion on June 16, 2022, the project's completion date has been extended to October 9, 2024, due to a 666-day extension of time. This delay has affected the project's performance significantly. Despite the importance of time, cost, and quality as key performance indicators, there has been limited research on these aspects in relation to the Bahir Dar-Tisesat project. This gap underscores the need for a detailed study into the factors influencing the project's performance, with a focus on time, cost, and quality.

### **1.3. Research Objectives**

#### **1.3.1. General Objective**

The main objective of the research is to assess road construction project performance in Ethiopian roads administration [the case of the Bahirdar-Tisesat design and build road project].

#### **1.3.2. Specific Objective**

The following are the specific general of this work:

1. To evaluate the factors that affect performance of the Bahirdar-Tisesat design and build road project in terms of cost, quality, and time.
2. To identify challenges that affect the road project under Ethiopian roads administration in the case of the Bahirdar-Tisesat design and build road project.
3. To Determine the inter relationship exist between the factors (Time, Cost and Quality) of the Bahirdar-Tisesat design and build road project in terms of cost, quality, and time.
4. To forward intervention strategies which can maintain road construction project performances.

### **1.4. Research questions**

1. What are the factors that affect the performance of the Bahirdar-Tisesat design and build road project in terms of cost, quality, and time?
2. What are the challenges that affect the Bahirdar-Tisesat design and build road project under the Ethiopian Roads Administration?
3. What is the interrelationship between the factors of time, cost, and quality in the performance of the Bahirdar-Tisesat design and build road project?
4. What intervention strategies can be implemented to maintain and improve the performance of road construction projects?

## **1.5. Scope of the Study**

**Thematic Scope:** This study focuses on evaluating the performance of road construction projects by examining the impact of three fundamental independent factors: time, cost, and quality. It explores how each of these factors affects the overall performance of road construction projects. By analyzing these key variables, the study aims to provide a comprehensive understanding of their influence on project outcomes, identifying the interrelationships between them and their effect on project success. This thematic scope ensures a targeted investigation into how time management, cost control, and quality assurance contribute to the efficiency and effectiveness of road construction projects, offering insights for improving future project performance.

**Spatial Scope:** The Bahirdar-Tisesat road project spans a total length of 21.2 kilometers and is located in the Amhara Regional State of Ethiopia. The project is administered by the Ethiopian Roads Administration. This study specifically assesses the performance of the road construction project within this geographic area, focusing on the factors affecting the project's outcomes within the defined spatial boundaries. The spatial scope ensures that the evaluation is localized to the Bahirdar-Tisesat project area, providing insights into the project's performance in its specific regional context

**Temporal Scope:** The Bahirdar-Tisesat design and build road project, managed by the Ethiopian Roads Administration (ERA) under the Bahir Dar Project Management Office, was scheduled to begin on August 15, 2019, with an expected completion date of June 16, 2022. However, due to a range of challenges impacting the project timeline, including both external and internal factors, the project has encountered significant delays. As a result, the scheduled completion has been extended, moving the new target to October 9, 2024.

## **1.6. Limitation of the Study**

This study specifically examines the Ethiopian Roads Administration (ERA) within the context of the Bahirdar-Tisesat design and build road project. Consequently, the findings and conclusions drawn are primarily applicable to this particular institution and project. Generalizing these results to other institutions or different road projects under the Ethiopian Roads Administration may not be appropriate due to variations in management practices, project dynamics, and contextual factors that could significantly influence outcomes.

## **1.7. Significance of the Study**

The construction industry, characterized by its complexity and involving numerous stakeholders such as clients, contractors, consultants, and regulators, faces significant challenges in Ethiopia's road construction projects. These challenges include delays, cost overruns, and quality deficiencies, which undermine project success and societal benefits. This study is crucial as it aims to assess the performance of Ethiopian Roads Administration (ERA) projects, specifically focusing on the Bahirdar-Tisesat design and build road project. By analyzing key performance indicators (like time, cost, and quality) within construction project frameworks, the research seeks to uncover and understand the primary operational issues affecting project outcomes. The findings will not only identify practical challenges but also provide valuable insights for improving project management practices within ERA. Ultimately, the study aims to formulate targeted recommendations that can enhance the overall performance of road construction projects under the Ethiopian Roads Administration, thereby contributing to more efficient resource allocation, timely project delivery, and improved infrastructure quality.

## **1.8. Organization of the Study**

Chapter One: Introduction- This chapter addresses the general background of the research, objective to be achieved, research questions, problem statement, significance of the research and the general Research outline.

Chapter Two: Literature Review- in this chapter relevant Literatures which supplement the topic understudy was incorporated.

Chapter Three: Materials and Methods- in this part of the research, the methods followed to achieve the aim are presented in detail comprising sample taken, Data collected, Analysis and Presentation methods.

Chapter Four: Analysis and Description- In this chapter the collected data analyzed using RII and Average percentage was presented and the description of the result of the computations is revealed.

Chapter Five: Conclusion and Recommendation-this section of the research concludes on the major findings of the research and encompasses valuable recommendation for the improvement of performance measurement practice.

# **CHAPTER TWO**

## **LITERATURE REVIEW**

### **2.1. Introduction**

Development goals are achieved by road construction projects. To assure the success of projects, numerous efforts have been undertaken to develop the road (Weldegebriel, 2018).The demand for road construction all over the world is promptly increasing, as the numbers of population grow (Dachasa, 2022).In a number of developing countries, road infrastructure is not constructed on time, cost-effectively, and with the best quality aspects.

Road projects involve a wide range of individuals, including regulators, suppliers, contractors, clients, consultants, and members of the general public. It has been proven that there is insufficient attention paid to or control over the inherent risks and uncertainties associated with construction projects. Thus, in order to ensure that the project is successful in terms of time, money, and quality, a range of strategies must be employed to manage these risks and uncertainties in an integrated manner ( A.Zerihun ,2023 )

This chapter presents a theoretical, empirical, and research gap in the literature related to the factors affecting construction road performance.

### **2.2. Theoretical Literature Review**

#### **2.2.1. Concepts of the Project**

A project, as defined by (Semira Hussein, 2021) is a series of unique, complex, and connected activities having a goal or purpose that must be executed within specific time, within budget, and predefined specification. Every project is unique in its own right, be it in terms of the amount of time needed to complete it, the location, the quality of the work done, the budget, or other factors like the stakeholders( A.Zerihun ,2023 ). As projects become increasingly more complex due to increased size, number, and supply chain participants, project managers are faced difficulty in delivering services on time, on budget, with great customer satisfaction (Dachasa, 2022). Projects have a restricted time, quality, and resources and are planned for a specific plan in relation to time, expense, and resources (Gebremedhin Sebsibe, 2019).

In the domain of road construction, achieving cost-efficiency, high quality, and timely completion is critical. The literature reveals a many of theoretical frameworks and models that

emphasize the interaction among these factors, often referred to as the "Iron Triangle" (Kumar & Kewley, 2021) of project management.

Evaluating the significance of various factors in road construction projects is essential for effective project management. Different methods are used to assess and rank these factors, each with its unique approach to gathering and analyzing data. SPSS (Statistical Package for the Social Sciences) (Acton & Miller, 2009 ) is a powerful tool for conducting statistical analysis and can be used effectively to evaluate and rank factors in road construction projects specifically focusing on Relative Importance Index (RII) and Factor Analysis. The Relative Importance Index is a widely used method to rank factors by their significance based on survey responses from respondents(Tarek et al., 2022). Respondents rate the importance of each factor on a Likert scale.

### **2.2.2. Concepts of performance**

Most project performance measurement instruments focus on several project elements, including cost, quality, schedule, and environment. These all provide a comprehensive framework for evaluating project performance from different perspectives, ensuring that projects are managed effectively and achieve their intended objectives(Cheung et al., 2004).

#### **2.2.2.1. Time Performance**

Time performance involves completing the project within the scheduled timeframe (Dewanto et al., 2019). Key concepts include:

**Scheduling:** Creating a timeline that defines when project tasks should be completed, using tools like Gantt charts or Critical Path Method (CPM).

**Time Management:** Monitoring progress to ensure that the project stays on schedule, identifying delays, and implementing corrective actions.

**Milestones and Deadlines:** Setting specific targets and deadlines to track progress and ensure timely completion of project phases.

#### **2.2.2.2. Cost Performance**

Cost performance refers to managing the project's budget effectively, ensuring that expenditures do not exceed the allocated funds (Shrestha & Mani, 2014). Key concepts include:

**Budgeting:** Establishing a detailed financial plan that outlines expected costs.

**Cost Estimation:** Predicting the total costs of the project, including materials, labor, equipment, and overhead.

**Cost Control:** Monitoring and managing costs to prevent overruns, using techniques such as Earned Value Management) to track cost performance against the project plan.

### **2.2.2.3. Quality Performance**

Quality performance ensures that the project meets specified standards and requirements (Hidayati et al., 2023). Key concepts include:

**Quality Planning (QP):** Defining quality standards and how they will be achieved.

**Quality Assurance (QA):** Systematic activities to ensure that quality standards are met, including process audits and reviews.

**Quality Control (QC):** Inspecting and testing materials, processes, and outputs to identify defects and ensure they meet quality standards.

(Enshassi et al., 2009) points out that performance should be defined as the sum of the effects of work, because they provide the strongest relationship with the organization's strategic objectives, the customer's satisfaction and the economic contributions. As the author says, performance must take into account both inputs (the effort put in) and outputs (the result of the effort put in). This definition equates performance with the sum of the effects of work. Performance is achieved when all efforts are focused towards achieving the set objectives and meeting customer's satisfaction. (Takim & Akintoye, 2002)states the concept of performance as related to the survival and success of an organization or project.

### **2.2.3. Performance Measurement in the Construction**

Performance measurement revolution has indeed spread to many industries, including construction (Takim & Akintoye, 2002). There are various levels at which performance is evaluated, including sector, project, and activity. (Munir & Baird, 2018) stated that the project-oriented construction sector, every project is different and has the potential to serve as a

prototype. To guide the project at any desired stage, the construction industry needs an active performance measuring system. Better division of the major constituents of the construction industry clients, construction firms, practitioners, products, material suppliers, consumers/the public, and other stakeholders as well as the application of particular measurement indicators for monitoring and evaluation of each component to achieve specific goals of interest would improve industry performance. Therefore, the building industry's success and growth will be determined by adding together the performance of its constituent parts.

#### **2.2.4. Project performance**

The success of a construction project can be determined by project performance (Gherbal & Sagoo, 2014). But in the construction sector, the notion of project performance is not well defined (Monika Meshram, 2020). In the context of construction projects, performance refers to both the effectiveness and efficiency with which a construction site operates (Befkadu et al., 2016). Nonetheless, the idea of project performance is evolving in a variety of ways as a means of determining what constitutes a successful project (Dachasa, 2022). However, there is no one standard way to quantify a project's performance, and each project has its own set of success criteria (Adam et al., 2015)

Every construction project is at the absolute least assessed by comparing the final product to the objectives stated in the budget and schedule. The project's status has been indicated by a few key metrics, such as the number of installed elements or the cubic meters of concrete poured (Kumar R, 2016) However, different stakeholder viewpoints can be used to evaluate project performance, with an emphasis on unique performance metrics. Together, the results show the benefits and drawbacks of the project within a practical framework for performance assessment. Measuring project success serves multiple goals, such as comparing, rewarding, and determining the efficacy of the organization's strategy across all organizational levels (Mengistu et al., 2016).

#### **2.2.5. Organizational performance**

The corporate environment's increasing complexity and competitiveness have mirrored changes in the scope of the concept of organizational performance. Reaching a consensus on the definition of performance at the entity level is difficult since different stakeholders have distinct interests and varied activities that an institution specializes in. The objectives of the entities are oftentimes unclear, dynamic, polarizing, and sometimes contradicting. In these conditions, the

performance is a complex and subjective phenomenon (Weldegebriel, 2018). The highly valued outcomes of organizational performance identification make clear how important it is (Khattry et al., 2016).

Individual and collective performance contributes to the overall performance of an organization. Performance, however, is concerned with the company's goals, successes in relation to how well the organization uses its resources and consideration of the operating environment in all companies (Enshassi et al., 2009). Organizations now work in a dynamic environment where fulfilling the evolving requirements of all stakeholders is essential to success. As such, a business cannot develop a self-serving performance assessment system. Businesses must assess performance from the outside in, paying attention to stakeholders such as suppliers and customers (Mengistu et al., 2016). Assessing a suitable performance is essential to the success of a business (Bireda, 2020).

A construction organization's success is influenced by a number of significant aspects. Since these performance metrics are the foundation for creating a system that measures performance effectively, identifying them is crucial (Kenea et al., 2021). Management accounting, controls, and performance evaluation should be used by the business to make sure that worker actions are in line with its objectives and plans (Serpell & Herdoiza, 2005). The main considerations that management of all businesses should have, however, should be connecting performance to strategy, setting performance standards and targets, connecting rewards to performance, and weighing the potential benefits and limitations of performance measurements. However, the performance measures selected should: assess the efficiency of resource utilization within the organization, evaluate the efficacy of all processes, including those involving goods and/or services that have reached the end user; include a suitable blend of quantitative and qualitative methods; appropriately emphasize both the short- and long-term aspects of the business; and be flexible and adaptive to an ever-changing business environment. An organization should specify its desired performance and provide guidance on how to create performance indicators to gauge that success. On the other hand, strategically aligned performance indicators should enhance organizational results by augmenting the amount of pertinent information available to managers for decision-making, thereby simplifying the process of making strategically consistent decisions (Ayalew et al., 2016).

### **2.2.6. Project success**

The concept of project success in the construction industry is ambiguous and varies among different individuals. Some authors focus on time, cost, and quality as primary targets, while others suggest that success is more complex. In the late 1980s, after the introduction of Total Quality Management (TQM), a project was considered a success if it met internal performance measures and was accepted by the customer. However, (Serpell & Herdoiza, 2005) highlighted that determining a project's success or failure is more complex. If a project's completion time exceeds its due date, expenses exceed the budget, or outcomes do not meet an organization's performance criteria, it is considered a failure. Similarly, a project perceived as a success by a project manager and team members might be perceived as a failure by the client, and a project considered a failure by top management (Hidayati et al., 2023), if the outcome does not meet top management specifications. Both parties evaluate project success differently, and the outcome is valued differently. However, success is defined as progress toward strategic goals, which is acceptable for this study to highlight the concept of project success.

### **2.2.7. Factors that affect Road Project Performance**

#### **2.2.7.1 Factors Affecting Cost Performance**

Project cost is the total project cost which includes design fees, material costs, and construction costs, permit fees, land, furnishings, financing and all other costs that are incurred in completing a project (Moschouli et al., 2018) . The ability to accurately predict the client's financial commitment to a project, which also forms the basis of the contractor's eventual revenue, has many advantageous implications (Futa et al., 2023). As a pre-warning indicator, alternative courses of actions can be examined and provision can be made for the preferred option. The client according to has the capital and related interests to consider often with no prospect of a financial return until full completion of the project. (Cheung et al., 2004). As (Sen et al., 2008) stated factors identified by contractors affecting cost and time in a survey carried out include the following: price fluctuation, inaccurate estimates, delay (time overrun), additional work, fraudulent practice and kickbacks, shortening of contract period, construction method, poor contract management, subcontractors and nominated suppliers, mistake during construction and non-adherence to contract condition.

### **2.2.7.2 Factors Affecting Time Performance**

Project schedule is a tool that communicates what work needs to be performed, which resources of an organization will perform the work and timeframes in which that work needs to be performed (O et al., 2014). Project schedule should reflect all of the work associated with delivering the project on time asserted that various factors have been identified by different researchers from the time aspect in different construction industries. Lack of materials, incomplete drawing, incompetent supervisors, lack of tool and equipment, absenteeism, poor communication, poor site layout, inspection delay and rework were found to be the most significant problems affecting project duration (time).

### **2.2.7.3 Factors Affecting Quality Performance**

(Mat Salleh et al., 2022) stated the quality management system forecasts potential difficulties and concerns with the completed project's quality by tracking and analyzing its quality.

Quality is the summation of the following characteristics, right first time, value for money, customer satisfaction, and consistent conformation to specification. Excellence, conformation to standards or specifications, and fitness for purpose has all been criticized as definitions of quality)

### **2.2.8. Challenges that affect Road Project Performance**

Road performance is critical for transportation efficiency and safety, yet various challenges significantly impact its effectiveness. This review synthesizes key issues identified in the literature.

**Material Quality:** The durability of road surfaces largely depends on the quality of materials used. Studies show that poor-quality asphalt and aggregates can lead to premature failure, affecting ride quality and safety (Mengistu et al., 2016)

**Environmental Conditions:** Weather extremes, including temperature variations and moisture, pose significant risks to pavement integrity. Research indicates that freeze-thaw cycles can lead to cracking and surface deterioration (Semira Hussein, 2021).

**Traffic Load:** Increased vehicle loads, particularly from heavy trucks, contribute to accelerated wear. Traffic patterns significantly influence pavement distress, with heavier traffic correlating with more rapid degradation (Dachasa, 2022).

**Design and Engineering Practices:** Inadequate design practices can lead to structural deficiencies. Effective pavement design must consider both material properties and anticipated traffic loads to enhance longevity .

**Geotechnical Factors:** Soil characteristics and groundwater conditions are critical in assessing road performance. Poor soil support can lead to settlement and structural failures (Weldegebriel, 2018).

**Economic Factors:** Budget constraints can severely limit the quality of materials and maintenance efforts. Economic considerations often dictate the scope of road construction and rehabilitation projects (Ge et al., 2017).

In conclusion, the performance of road is influenced by a complex interplay of material quality, environmental conditions, traffic load, design practices, maintenance strategies, geotechnical factors, technology use, and economic constraints. Addressing these challenges requires a holistic approach involving improved materials, advanced technologies, and strategic planning.

### **2.2.9. Inter relationship between the factors (Time, Cost and Quality)**

The Triple Constraint, sometimes referred to as the Project Management Triangle, is a model that shows the three key elements of a project: quality, cost, and time. Since all of these parts have a relationship, changes to one will have an effect on the other two. As an instance, you could have to increase costs or reduce the quality of the deliverables if you wish to minimize the time required for completing a project. However, you might need to extend the project's time or raise its cost if you wish to improve the quality of the deliverables.

Time, cost and quality are the three factors that play a significant role in the planning and controlling of construction projects. The definition of project success by (Kenea et al., 2021) definition of project success includes meeting quality output standards and meeting time and budget objectives respectively. The main barriers for their achievement are the changes in the project environment necessitating cost, time, and quality trade-offs.

According to research conducted by poured (Kumar R, 2016), the majority of construction projects are selected based on only two of these factors, specifically cost and time. This results in

reason due to the majority project management control systems emphasize timeline and cost with little regard for quality (Yang et al., 2010). Similarly, (Getahun, 2016) argued that the main problems in traditional approaches to project delivery have been in extensive delays in the planned schedules, cost overruns, serious problems in quality, and an increase in the number of claims and litigation associated with construction projects.

#### **2.2.10. Performance Measurement Theory**

Measures of performance are a useful tool for managing, comprehending, and improving organizational activities (Munir & Baird, 2018). By providing quantitative information on goods, services, and the processes that go into producing them, it can be used to compel a company to concentrate on the proper problems. Performance metrics can be used to assess the kind or volume of program activities carried out (process), the direct goods and services a program delivers (outputs), and/or the outcomes that emerge from those goods and services (Kenea et al., 2021).

Performance measures, performance targets and criteria, and any other techniques that assess the accomplishment of a given objective are all included in performance measurement (El-samadony et al., 2020). In summary, construction performance measurement is the systematic gathering and dissemination of data regarding the inputs, efficiency, and efficacy of construction projects. In order to increase program efficiency and effectiveness in businesses, it is used to evaluate project performances in terms of both financial and non-financial factors and to compare and contrast the performance with others.

Performance measures, according to (Takim & Akintoye, 2002), measure something, usually progress toward an objective or goal. Therefore, it doesn't matter if they are referred to as performance indicators, performance standards, or anything else; what matters is the idea that a performance measure measures something. (Bireda, 2020) described performance measures as a metric that is used to quantify the effectiveness and efficiency of action. However, a metric is, by definition, any type of measurement that is used to gauge the quantifiable component of performance. A metric can be produced from directly observable data, like the number of Change Orders or a cost performance index (CPI), or it can be directly collected by observation, like the number of faults identified or the number of days late. A metric is referred to as an indicator or

key performance indicator (KPI) when it is used to evaluate the health of a project or program (Adam et al., 2015)

According to (Weldegebriel, 2018) , performance cannot be evaluated until these goals are converted into quantifiable intended outcomes . On the other hand, comparing the actual results to the performance indicators ought to show how close the goal is coming together. It is recommended that organizations create and establish goals for performance indicators wherever feasible project success is the ultimate goal of any project, and it stems from the project's performance. For both clients and contractors, achieving the most advantageous and desired outcome requires both identifying the performance assessment criteria and understanding the relative importance of each criterion (Yang et al., 2010).

### **2.2.11. Performance Measures**

Performance measures are essential tools for understanding, managing, and improving the performance of organizations (Munir & Baird, 2018) . They help organizations focus on the right issues by quantitatively telling us something important about products, services, and processes that produce them. Performance measures can address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and/or the results of those products and services (outcomes). Performance measures are composed of a number and a unit of measure, which give us a magnitude (how much) and a meaning (what). They are always tied to a goal or objective (the target).

In literature, project performance of the construction industry is measured in terms of time, costs, quality, and many more factors. It is difficult to build an accurate model that includes every single performance metrics affecting performance of the construction industry (Yang et al., 2010). If performance of different construction sites is to be measured and compared, objective and comparable meters are needed. A typical problem in studies concerning the objective measurement of construction project performance is what the performance components are and how they can be measured. In order to determine what the performance components for a construction site are, and how they can be measured, it is necessary to review what performance areas have typically been studied for construction projects and what means have been used to measure them.

(Costa & Formoso, 2000) identified ten key performance metrics: Customer Relations, Safety, Schedule, Cost, Quality, Profit, communication and Collaboration, productivity, Environment, and Customer satisfaction. The actual criteria used by clients to measure the performance of a construction project during construction and upon completion, such as construction cost, Construction time, Quality of finished project, Occupational health and safety, Level of technology, Environment friendliness, Construction flexibility, Labor dependency, Quality of coordination by construction team, Contractor's project management & Contractor's capacity of manpower.

According to (Ghonamy & El-Mikawi, 2018) there are five main factors that determine how well a project performs: quality, cost, time, and customer satisfaction. Using criteria for time, safety, participant happiness, user expectations and satisfactions, environmental performance, commercial profitability/value, quality, and cost. Presented a unified framework for evaluating the success of construction projects. Introduced the key performance indicators that are suggested to be part of the agreement that will be reached between the contractors and contracting bodies. These indicators serve as the foundation for carrying out the process of benchmarking and performance measurement.

In conclusion, performance measures are crucial tools for organizations to understand, manage, and improve their performance. They help organizations focus on the right issues by quantifying the efficiency and effectiveness of their actions. By identifying the performance components and measuring them accurately, organizations can achieve the most favorable and desired outcomes for both clients and contractors.

### **2.2.12. Performance Measurement Methods**

The modern business environment is characterized by rapid changes due to technological advancements, increased competition, and customer demands. Business performance measurement is an essential strategic management tool that enhances the competitiveness of companies (NOHSC, 1999). Successful businesses prioritize the needs of their employees, customers, and communities in their management policies and processes. However, measuring organizations' business performance is challenging due to difficulties in finding definitions for performance, competitiveness, effectiveness, and related concepts, as well as measures and metrics for these concepts.

There is little agreement on the best business performance measurement system to implement. To address this, various methods, frameworks, perspectives, and models have been developed to enable organizations to measure and manage their performance effectively. Performance measurement tools and models are needed to measure performance, and the type of tools depends on what organizations need to see in the results.

(EVO, 2012) stated that performance measurement framework is a general theoretical framework developed in research that can act as the basis for an organization's performance measurement system. Previous frameworks have suggested that performance measurement should be translated from strategy, but some research asserts that stakeholders' needs and contributions should be prioritized. The framework must be proposed for application in both situations, while designing and analyzing systems or approaches to measure performance information.

The objective of performance measurement frameworks is to help organizations define a set of measures that reflects their objectives and assess their performance appropriately (Monika Meshram, 2020). Strategic metrics should be based on a theoretical model of an organization's ideal operation, and measuring project success can play a key role in improving project management competency.

### **2.2.13. Performance Indicators**

In response to research, the UK working groups on Key Performance Indicators (KPIs) have determined ten metrics for benchmarking projects in order to attain good performance (Shrestha & Mani, 2014). Though predictability of design cost and time, predictability of construction cost and time, and safety can be considered process-oriented thinking, most of these indicators, such as construction time and cost, defects, client satisfaction with the product and service, profitability, and productivity, promote result-oriented thinking.

Key performance indicators are essential for evaluating the performance of construction projects and can be utilized for bench marking and future evaluation (Tarek et al., 2022). They enable construction companies to compare their performance, identify strengths and weaknesses, and recognize patterns across different projects and enterprises. Performance measurement, according to (Munir & Baird, 2018), is the process of comparing intended and actual

performances. KPIs were categorized by <sup>1</sup>as project- and site-specific, acknowledging that they vary according to the nature of the project and the site. Early supplier and contractor involvement was identified as a chance to enhance performance through recommendations and targeted suggestions.

Key Performance Indicators (KPIs) are indicators created by the UK Construction Industry Best Practice Program to assess organizational and project performance. Three processes are involved in implementing these indicators: determining what needs to be measured, obtaining information, and computing and interpreting the outcomes (Serpell & Herdoiza, 2005). KPIs are a helpful tool for measuring and communicating with many stakeholders, including clients, employees, investors, and subcontractors. Since they provide unbiased standards for project accomplishment, they are regarded as an essential component in determining project success. Nevertheless, data indicates that there are other success factors outside the 'golden/iron triangle' of quality, cost, and time. KPIs should be made to track progress and offer pertinent insights for management and management in order to simplify performance (Ghonamy & El-Mikawi, 2018). Be easy to understand and lead to action. States developing a range of KPIs to measure performance should consider the following factors:

- ✓ KPIs are general indicators of performance that focus on critical aspects of outputs or outcomes.
- ✓ Only a limited, manageable number of KPIs is maintainable for regular use.
- ✓ Having too many (and too complex) KPIs can be time and resource consuming.
- ✓ The systematic use of KPIs is essential as the value of KPIs is almost completely derived from their consistent use over a number of projects.
- ✓ Data collection must be made as simple as possible
- ✓ For performance measurement to be effective, the measures or indicators must be accepted, understood and owned across the organization.
- ✓ KPIs will need to evolve and it is likely that a set of KPIs will be subject to change and refinement.
- ✓ Graphic displays of KPIs need to be simple in design, easy to update and accessible.

Overall, the purpose of key performance indicators is to enable the measurement of project and organizational performance in the construction industry (El-samadony et al., 2020). This information can then be used for bench marking purposes, playing a crucial role in organizations' efforts to achieve best practice.

### **2.3. Empirical Literature Review**

(Getahun, 2016) states that delays in mobilization, including the late deployment of resources such as labor, machinery, and materials, were identified as a critical issue impacting project timelines. The study found that this factor had the highest Relative Importance Index (RII) of 0.725, indicating its significant influence on the timely completion of road construction projects.

(Ezekiel & Emmanuel, 2023) stated that the factors affecting time and cost performance of road construction projects in Ondo and Ekiti states, Nigeria. They were analyzed using SPSS 19 and presented in simple descriptive and percentage tables. Spearman's rank correlation was used for the test to analyze the relationship between initial contract sum and actual completion cost ( $r = 0.951$ ,  $p < 0.01$ ). The results showed that inadequate equipment, managerial skills, project complexity, equipment failure, and material shortages were key factors affecting time performance. Inflation, inaccurate estimates, fraudulent practices, contractors' inexperience, inadequate planning, and overdesign were also significant factors affecting cost performance. The study recommends that governments reduce inflation rates, ensure stability in construction material prices, and address bottlenecks within bureaucratic structures to improve the performance of road construction projects. The findings highlight the need for effective management and planning strategies in road construction projects.

Financial difficulties, particularly cash flow problems, were also recognized as major contributors to project delays and cost overruns. (Bireda, 2020) highlighted that financial constraints ranked second, with an RII of 0.708, underscoring their crucial role in the successful execution of road construction projects. Similarly, (Befkadu et al., 2016) emphasized that financial problems, especially cash flow issues, were significant causes of delays in road construction projects, reiterating the importance of financial stability for on-time project completion.

Additionally, poor site management was identified as a significant factor leading to reduced construction quality, with an RII of 0.645833. This finding stresses the need for effective management practices to uphold quality standards in road construction projects, as highlighted by (Ayele, 2020).

### **2.3.1. Best international practices in road construction project performance**

(Adekunle et al., 2020) stated that developing African nations, including Nigeria, Kenya, Ghana, Uganda, and Tanzania, also face the majority of these issues. Tanzania discovered that, after taking into account seven projects, the average rates of total cost and time overrun were 44% and 26%, respectively. The average contribution of poor design was found to be 26% and 32%, respectively, among other factors. The percentage contribution of deficient design to cost and time overruns was found to be 61% and 85%, respectively.

Kenya's scenario is similar to that of the majority of other African nations. The building sector is confronted with numerous issues, including budget overruns, project delays, structural flaws, and an excessive reliance on foreign labor (Wandiri & James, 2020). Most construction projects in Kenya, particularly those involving road infrastructure, are subject to severe cost escalation to the point that they require not only additional financing but also specialized knowledge, which causes disagreements amongst the project's stakeholders regarding technical and project management issues.

(Ikuabe & Oke, 2020) performed a study to investigate the variables influencing the performance of construction costs in Nigerian construction areas. He discovered from the analysis that in addition to project complexity, project shortening, and fraudulent practices, other significant contributors to cost overruns included contractor inexperience, poor planning, inflation, constant variation orders, and changes in project design.

(Akinradewo et al., 2019) did a research on the performance of construction projects in Nigeria and the relationship between project leadership and team makeup. Following the testing of the hypotheses, it was determined that there was a substantial correlation between the project leader's professional backgrounds, leadership style, team makeup, and overall project performance. The

profession of the project leader and the overall project performance did not appear to be significantly correlated.

(Oyetunji et al., 2019) stated some possible elements that contribute to the construction contract's unsatisfactory performance. He further divided these factors into eight groups: factors resulting from contractual relationships, factors related to material and labor, factors related to subcontractors, factors caused by contractors, factors caused by consultants, factors related to project procedures, and factors resulting from the external environment.

According to (Choudhury, 2001), the implementation of international construction projects is impacted by more intricate and dynamic elements than residential projects; external uncertainty, such as political, economic, social, and cultural risks, as well as internal project risks, frequently cause the construction project to suffer or be significantly impacted.

(Shubham Vyas, 2013) in their study carried out in Vietnam on elements influencing the results of construction projects found that the presence of foreign specialists in the project, government inspectors, and strict supervision when novel building techniques are used are important enablers that contribute to project success.

(Agosta, 2006) in his thesis examined the factors influencing the performance of construction projects in the Gaza Strip and determined that the most significant factors, as agreed upon by the owners, consultants, and contractors, were: average delay due to closure and shortage of materials; availability of resources as planned throughout the project duration; project manager leadership skills; escalation of material prices; and the quality of equipment and raw materials used in the project.

Performance include factors such as time, budget, safety, quality, and overall client satisfaction (Bener et al., 2003). Enhanced cost, schedule, and quality during the design and construction phases are the goals of project performance measurement. Performance measurement is the process of comparing intended and actual performances, according to (Egila et al., 2020). The success of the construction business is influenced by national economies.

Research was done to find out what influences project performance in developing nations. Construction delays in the United Arab Emirates are caused by a variety of factors, including a

lack of skilled labor, inadequate supervision, bad site management, inappropriate leadership, a shortage of equipment, and equipment breakdowns (Wandiri & James, 2020). The selection of contractor(s) is an important decision for the project manager and typically determines the success or failure of the project (Ezekiel & Emmanuel, 2023). There's no denying that a contractor's performance will influence how well the contract performs. The building business has had difficulties evaluating performance for many years, he added. To assess the performance of projects, scholars have put forth a number of models and techniques. But as (Olbrich, 2014) out, the majority of these processes restrict their analysis to certain metrics like labor productivity, cost, or scheduling. Reliability to the client, timeliness, economy, quality of construction, and sustainability are all aspects of construction performance. According to (Z. Ismail et al., 2010), one of the main things preventing successful project delivery in South Africa is the attitude and quality of the services provided.

### **2.3.2. Best local practices in road construction project performance**

A survey and case study on the causes of cost overruns in Ethiopian federal road projects the Southern District have been carried out by (Shiferaw Belachew, 2017). The study found that the top six factors that lead to project cost overruns were fluctuating material prices, underestimating project costs, delays in raw material supply, inadequate contract document review, lack of coordination during the design phase, and lack of cost planning during the pre- and post-contract stages. These factors had the biggest effects on how well project costs performed from the perspectives of clients, consultants, and contractors.

(Tadewos & Patel, 2018) performed desk research and a questionnaire survey to describe the problems with overinflated costs in road projects in Addis Ababa. This analysis determined every road construction project that met schedule and budgetary requirements.

(Hailu, 2018) highlights several critical determinants of time and cost overruns in road projects. These factors collectively contribute to project delays and budget excesses, impacting the overall success of construction projects

## **2.4. Research Gaps**

Construction project performance is assessed using key performance indicators. These indicators are crucial for any organization's journey toward attaining best practices and resolving performance issues, particularly for the Ethiopian Roads Administration. Most performance measurement scenarios incorporate variables like time, cost, quality, client satisfaction, productivity, and safety as Key Performance Indicators (KPIs) to assess the effectiveness of ongoing organizational projects and enhance the performance of upcoming projects. However, in the case of the Bahirdar-Tisesat road project, there has been no explicit description or research conducted that considers time, cost, and quality as the main variables. This represents a significant research gap, highlighting the need for a comprehensive study focusing on these critical factors to understand their direct impact on project performance. The absence of such detailed analysis limits the ability to identify and address specific issues that may be hindering the project's success. Earlier studies and literature reviews have established time performance, cost performance, and quality performance as the most significant indicators of project outcomes. Therefore, it is imperative to conduct a focused investigation on the Bahirdar-Tisesat design and build road project from the perspectives of cost, time, and quality. Understanding how these factors interact and influence project performance will provide valuable insights and practical solutions to enhance future road construction projects under the Ethiopian Roads Administration.

## **2.5. Conceptual framework**

The performance of Ethiopian road construction is receiving little attention. A review of the literature allows us to classify factors influencing road building project performance as independent or dependent. The research model that was created to assess these categories' impact on the study's performance in road construction is based on them. The graphic representation of it is shown below.

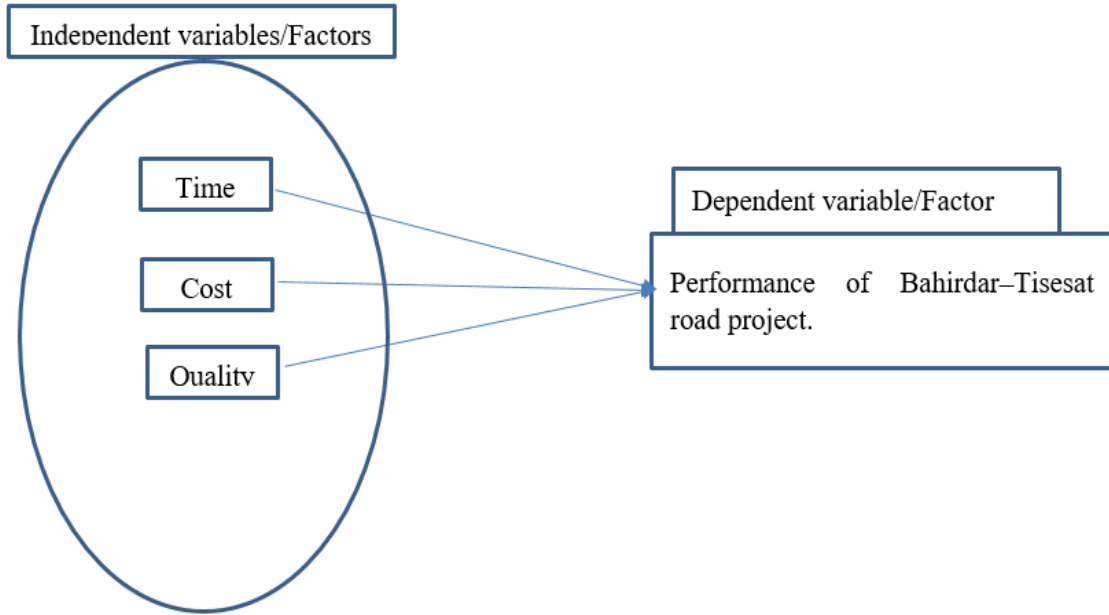


Figure 1. The dependent and independent variables of the study

## CHAPTER THREE

### METHODOLOGY

#### 3.1. Introduction

This chapter describes the methodology and procedures used to determine how to collect information and data from the study population through office and project site sources. Using the Bahirdar-Tisesat Design and Build road project as a case study, we assessed and ranked the performance of road construction projects within the Ethiopian Road Administration. This chapter discusses a description of the study area, research design and approach, target population and sample, data collection methods and tools, and methods of data analysis.

#### 3.2. Description of the study area

The study assessed the performance of road construction projects in Ethiopian Road Administration, using the Bahirdar-Tisesat Design and Build road project as a case study.

Table 3. 1.Study Area

Project Location	Amhara National Regional States/ West Gojjam Zone
Project Length (as per the conceptual design)	Approx. 21.2Km asphalt road
Start Point Description	The project starts 7 km East of the city centre of Bahir Dar town at the junction of along Bahir Dar - Mota Road
End Point Description	The project ends at Tis Abay town on Bahir Dar – Tis Abay Road
Type of Contract	Design and Build
Funded by	Federal Government of Ethiopia
Employer	Ethiopian Roads Administration
Contractor	MELCON Construction PLC
Letter of Acceptance issued	July 22, 2019
Date of Signing of Contract	August 15, 2019
Date of Commencement	December 16, 2019

Time for Contractor's Mobilization	4 months
Original Time for Construction	913 Calendar Days (including 4 months mobilization period)
Defects Liability Period	365 Calendar Days from the issue of the taking Over Certificate
Original Contract Completion Date	June 16, 2022
1 <sup>st</sup> Approved extended calendar days	180 calendar days
2 <sup>nd</sup> Approved extended calendar days	666 calendar days
Revised Completion date	October 09, 2024

Route map of the project area with respect to the map of Ethiopia is shown below.

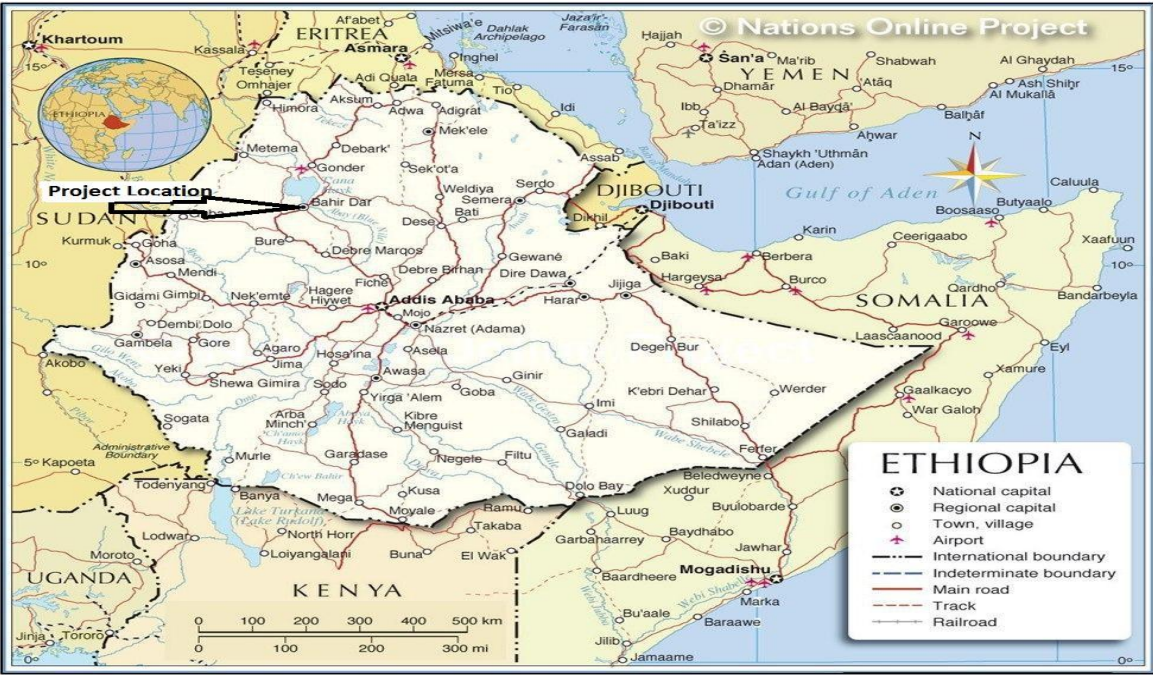


Figure 2. Map of Ethiopia and project location (ERA, 2023)

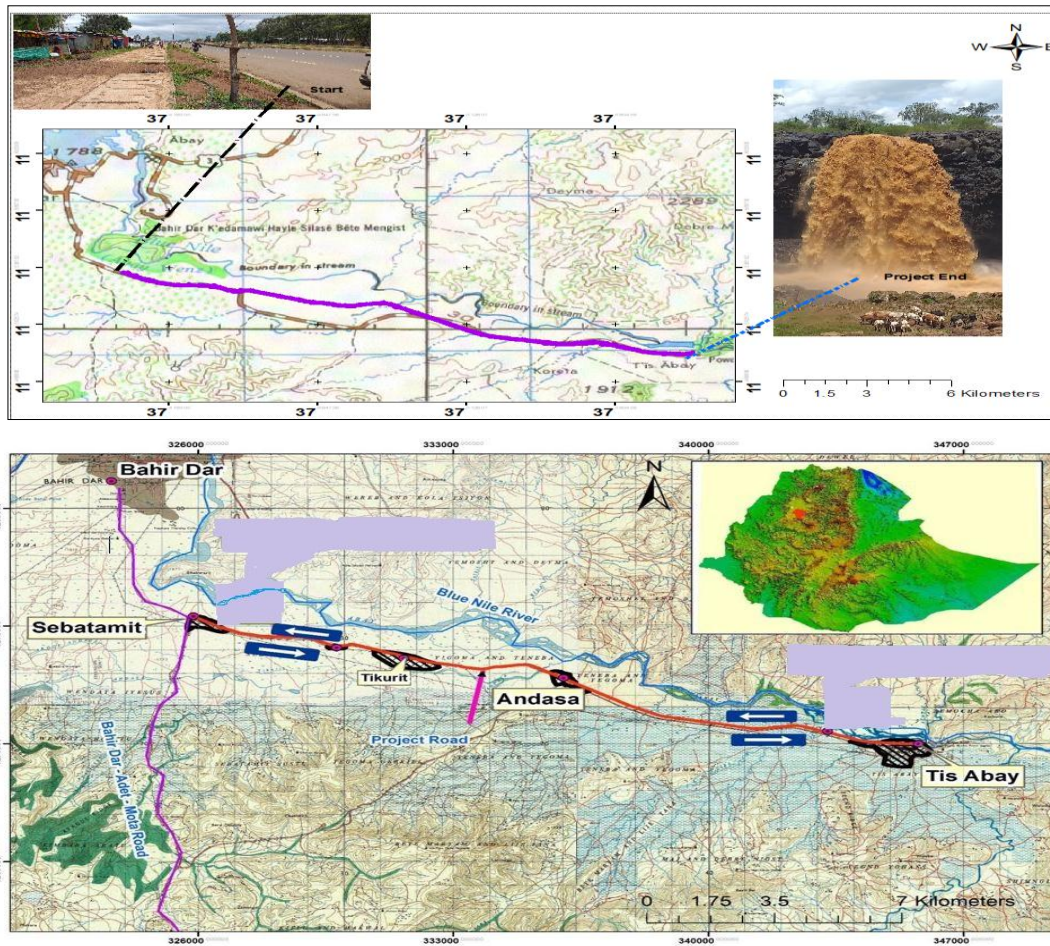


Figure 3. Project route (ERA, 2023)

Source: (ERA, 2023)

### 3.3. Research Design and Approach

#### 3.3.1 Research Approach

According to (Gamper et al., 2011) justification, there are two basic approaches to research, quantitative and qualitative: Quantitative research involves the collection and analysis of numerical data. It is used to quantify attitudes, opinions, behaviors, and other defined variables and generalize results from a larger sample population. This type of research often employs statistical, mathematical, or computational techniques to analyze data. Qualitative research, on the other hand, focuses on exploring and understanding phenomena through non-numerical data. It aims to provide a deeper insight into the problem by capturing participants' perspectives and experiences.

### **3.3.2. Research Design**

In this study, a descriptive and explanatory research design was used; the major purpose of descriptive research is a description of the state of affairs as it exists at present. Then this study describes and critically assesses the performance of the Bahirdar-Tisesat Design and Build Road Project.

This elaborate the methodological approach that is used; it describes the research methodology that is applied based on the study's objective. It describes how the data collected from the research was analyzed and presented, as well as the research design, sampling strategies, sample size calculation, data sources, and data collection instruments (Ayalew, 2009).

### **3.4. Data Sources**

The study collected data from a primary and secondary source. The primary sources of data were client, contractor, and consultant participation in Bahirdar Tisesat Road projects, gathered from the project management office (ERA), contractors, and consultants where the study has been targeted. By using the five-point Likert scale questionnaire for different workers in the sample project, research would obtain quantitative and qualitative data. Secondary data includes parts of information that have previously been collected, analyzed, documented, and published by other researchers or individuals. Consequently, the secondary data supported the study or its conclusions. The client, contractor, and consultant the three primary players in the construction were the data sources.

### **3.5. Target population and Sample**

#### **3.5.1. Target population**

(Adam et al., 2015) stated that population refers to the total number of people from which a sample is collected. The target population of this research was concentrated on road projects; the respondents it targeted consisted of client, contractor, and consultant who are directly involved in the Bahirdar-Tisesat Design and Build Roads projects. In order to collect accurate and reliable data, the researcher chose respondents who were directly involved in the Bahirdar-Tisesat Design and Build Road Project. Such as project managers, resident engineers, supervisors, site engineers, contract administrators, project coordinators, and right-of-way officials. Just 48 respondents were chosen from three parties.

### **3.5.2. Sampling technique**

A census study strategy was employed to ensure comprehensive and representative data collection from the entire population involved in the Bahir Dar-Tisesat project. This approach aimed to gather detailed and in-depth insights, essential for a thorough analysis of the factors influencing the project's performance. By distributing questionnaires to all directly involved employees, the study captured a full spectrum of perspectives and experiences, minimizing the risk of sampling bias. This exhaustive data collection method enhances the reliability of the findings and provides a robust foundation for identifying critical challenges and developing effective intervention strategies.

### **3.6. Data collection methods and tools**

Information gathered by means of a research survey comprises a set of questions, source documents from clients, consultants, and contractors, and other related progress reports. The questionnaire was distributed to contractors, client, and consultants.

Many factors influence the performance of the road construction project that has been considered for the purpose of this research. These variables are divided into three categories, each of which is taken into account while distributing questionnaires and is then collected and analyzed based on previous research (Muhamad & Mohammad, 2018). The five-point Likert scale questionnaire would be given to different workers in the sample project in order to collect both quantitative and qualitative data for the research.

In the study, several secondary data resources were employed to gain a comprehensive understanding of the Bahir Dar-Tisesat project's performance and challenges. These secondary data sources included:

#### **Letters Between Stakeholders (Contractor, Client and Consultant):**

Letters exchanged between the contractor, client, and consultant serve as crucial records of formal communication. These letters often contain details about project agreements, changes in scope, requests for clarifications, and responses to issues that arise. Analyzing these communications provides insight into the interactions and relationships between the key parties involved. This helps in understanding how effectively issues were addressed and how decisions

were communicated. It also sheds light on any recurring problems or disputes that might have impacted the project's progress and performance.

**Monthly and Annual Progress Reports:** Monthly and annual progress reports are valuable sources of information that document the ongoing status of the project. These reports typically include updates on project milestones, financial expenditures, completed work, and any deviations from the planned schedule. Monthly reports provide a snapshot of short-term progress, allowing for a detailed examination of recent developments, while annual reports offer a broader overview of the project's achievements and challenges over a longer period. Analyzing these reports helps in assessing the overall performance, identifying trends in progress, and evaluating how well the project is adhering to its timeline and budget.

**Document Reviews:** Document reviews involve a thorough examination of various project-related documents, such as contracts, design specifications, change orders, and meeting minutes. These documents provide detailed records of project requirements, contractual obligations, and agreed-upon changes. Reviewing these documents helps in understanding the original project scope, the nature of any modifications made, and how these changes were managed. It also aids in identifying discrepancies between planned and actual performance, as well as assessing compliance with quality standards and project specifications.

### **3.7. Data Analysis**

After gathering, the data must be processed and analyzed to produce results. Accordingly, (Befkadu et al., 2016) , in order to understand the meaning and importance of data, which is frequently referred to as raw material, analysis and interpretation must first take place. Due to this, both qualitative and quantitative techniques will be used in the data analysis.

The required data for the study was collected by means of distributing questionnaire. The collected data was computed with descriptive statics using help of IBM SPSS version 27 Statistics software. IBM SPSS version 27 presented through frequencies, means, Sums, percentages and other descriptive analysis. And the researcher used graphs and charts to display the findings to support analysis of the results with easy understanding.

The procedure that follows was used to determine the assessment ranking based on the RII (Relative Importance Index). For this study, the same methodology would be used with different

groups (i.e., client, consultant, and contractor). The five-point Likert scale will be adapted to Relative Importance Index (RII) and went from 1 (strongly disagree), 2 (disagree), 3 (slightly disagree), 4 (agree), and 5 (strongly agree).

The RII (Relative Importance Index) method is a statistical technique used to determine the relative importance of different factors or variables in a research study. It helps researchers understand which factors have the most significant impact on the outcome (dependent variable) (Michael, 2013). while the RII (Relative Importance Index) method was used to determine different road project perceptions of the relative importance of the factor affecting performance of the road construction project in the Ethiopian Roads Administration, specifically focusing on the Bahirdar-Tisesat design and build project.

To analyze the data, the Relative Important Index approach (RII) is employed. The relative importance index is calculated as follows:

$$RII = \frac{\sum W/A * N}{\dots\dots\dots} \quad (\text{Tikote et al., 2017}) \dots\dots\dots \text{Equation 1}$$

Where:

RII = relative importance index

W = weighting given to each factor by respondents (ranging from 1 to 5)

A = highest weight (i.e. 5 in this case); and

N = total number of respondents.

### **3.8. Data Validity and Reliability**

#### **3.8.1 Validity**

Validity is concerned with the extent to which an instrument measures what it is intended to measure. It is about the accuracy and appropriateness of the data collected. There are various approaches to evaluating the research's validity. A content validity test is applied in the present study. A measuring tool's content validity refers to how well it covers the subject matter being studied. A pilot study in which a questionnaire was given to four respondents in order to assess the questionnaire's quality prior to data collection was used to assess the validity of this research. The quality of the questionnaire was assessed by making adjustments based on the feedback from respondents before data collection as well as academicians' comments.

### 3.8.2. Reliability

Considering reliability, it is the ability of data collection and analysis processes to produce consistent results throughout time and the ability of different people to draw similar inferences and conclusions from the same raw data. Stated differently, it's a quality that allows for the same results when data collection techniques are repeated. Common methods to assess internal consistency include Cronbach's alpha and split-half reliability. (Gottman et al., 1998).

Internal consistency was used in this study, which entails comparing the Pearson correlations between the time, cost, and quality factors for each questionnaire question. As a result, it gauges how consistently respondents answered a subset of the questionnaire's questions or all of the questions overall. A number of techniques exist for determining internal consistency; in this study, the consistency of responders generated using IBM SPSS version 27 software was measured using Cronbach's alpha. The recommended minimum level is 0.7, though in exploratory studies it may be lowered to 0.6, and anything below 0.6 is often discarded (Kothari, 2004).

$$\alpha = \frac{k}{k - 1} \left( 1 - \frac{\sum_{i=1}^k \sigma_y^2}{\sigma_x^2} \right)$$

- $\alpha$  = Cronbach's Alpha
- k = Number of items in your scale
- $\Sigma\alpha^2y$  = Summated variance of each item
- $\alpha^2x$  = Variance of total scores

Table 1. Cronbach's alpha interpretation ( Cherniavskyi, et al., 2017)

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

### 3.8.3. Reliability test results

Table 2. Cronbach's alpha value of time, cost and quality factor

Factor	Cronbach's Alpha( $\alpha$ )	Remark
Time	0.949	Excellent
Cost	0.820	Good
Quality	0.881	Good

Source: Own Survey

Based on the results obtained in table 2, the Cronbach's alpha value for the time factor is within the excellent interval, while the values for cost and quality are within the good interval. This indicates that the internal consistency of the respondents' answers is reliable. In other words, the responses related to time demonstrate a very high level of reliability, and those related to cost and quality also show a good level of reliability. These Cronbach's alpha values suggest that the measurement scales used for these factors are consistent and dependable for analyzing the performance of the Bahirdar-Tisesat road project.

### 3.9. Ethical considerations

Respondent was informed about the purpose of the study. Confidentiality was maintained throughout the study by not disclosing the respondents' name on the questionnaire and research reports. No identifying information was entered on the questionnaires.

## CHAPTER FOUR

### RESULT AND DISCUSSION

#### 4.1. Introduction

This chapter examines the processing, presentation, and interpretation of the general information obtained from the respondents. The research questions are further addressed in this chapter in their respective order; each is answered by data analysis, and the results are presented in tabular form. Frequency, percent, diagram, RII, and rank are the principal metrics used to analyze and evaluate the findings. The responses obtained from questionnaire-based data from 48 persons who were working on the project were analyzed using SPSS software, and the results were also discussed within this chapter.

#### 4.2. Response rate

Table 3. Response rate of respondents

Questionnaire	Distributed	Questionnaire responded	Response rate (%)
Contractor	16	16	100
Client	17	17	100
Consultant	15	15	100

Source: Own Survey

The table provided above illustrates the response rate for the questionnaires that were distributed to clients, contractors, and other relevant stakeholders. It details the total number of completed responses received from each group. The data reveals that the total number of responses anticipated was fully achieved, resulting in a 100 percent response rate. This indicates that the survey was entirely successful in gathering the required feedback from all stakeholders.

### 4.3. Demography of the participants

Table 4. Demography of the respondents

Sex	Frequency	Percent
Male	35	72.9
Female	13	27.1
Total	48	100

Source: Own Survey

Respondents were asked about their gender and analysis was done using frequencies and percentages. 35 (72.9 percent) of the respondents were male while 13 (27.1 percent) were female, this indicates that majority of the respondents were male.

Table 5. Distributions of the three stakeholders

Stakeholders	Frequency	Percent
Contractor	16	33.3
Client	17	35.4
Consultant	15	31.3
Total	48	100

Source: Own Survey

Respondents were asked about their form of organization in the table and figure, and analysis was done using both tables and figures, which display frequencies and percentages. 16 persons (33.3 %) were from the contractor side, 17 persons (35.4 %) were from client side and 15 persons (31.3 %) were from the consultant side.

Table 6. Work experience of the respondents

Work Experience	Client		Contractor		Consultant	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Less than 3 years	4	23.5	2	12.5	-	-
3-8 years	9	52.9	7	43.8	6	40
9-12 years	3	17.6	3	18.8	7	46.7
12 and more	1	5.9	4	25	2	13.3
Total	17	100	16	100	15	100

Source: Own Survey

After asking respondents from the client side about their experience, frequencies and percentages were analyzed, as shown in the figure. 52.9% of the respondents reported having 3 to 8 years of experience, while 23.5% reported having less than 3 years of experience. Only 5.9% of respondents had experience exceeding 12 years, while 17.6% of respondents had experience ranging from 9 to 12 years.

For the case of the respondents from the contractor side 43.8 % of the respondents reported having 3 to 8 years of experience, while 12.5 % reported having less than 3 years of experience. 25 % of respondents had experience exceeding 12 years, and 18.8 % of respondents had experience ranging from 9 to 12 years.

Among the respondents who worked on the project for the consultant, 40% reported having 3 to 8 years of experience, while 13.3% of respondents had experience exceeding 12 years, and 46.7% of respondents had experience ranging from 9 to 12 years. And none of them have experience less than 3 years.

The respondents from the client side were asked about their positions on the project, and the data was analyzed using frequencies and percentages in the table as listed below

Table 7. Work position of the respondents

Position	Client		Contractor		Consultant	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Junior Engineer	4	23.5	1	6.3	1	6.7
Team Leader	1	5.9	-	-	-	-
Construction Engineer	-	-	4	25	2	13.3
Senior Engineer	3	17.6	-	-	4	26.7
Lead Engineer	6	35.3	1	6.3	-	13.3
Resident Engineer	-	-	-	-	2	13.3
Office Engineer	1	5.9	4	25	1	6.7
Project Engineer	1	5.9	2	12.5	-	-
Other	1	5.9	4	25	5	33.3
Total	17	100	16	100	15	100

Source: Own Survey

For the case of respondents from the client side 35.3% of the respondents were lead engineers, 23.5% were junior engineers, 17.6% were senior engineers, and each team lead, office engineer, and other professionals contributed 5.9%.

For the case of the respondents from the contractor side each of both office engineers and construction engineers was 25%; 12.5% were project engineers, while each of the two junior engineers and lead engineers were 6.3%, while respondents with other positions were 25%.

For the case of the respondents from the consultant side, resident and construction engineers individually were 13.3%, while 26.7% were senior engineers, resident engineers individually were 6.7%, and the other 33.3% were from another position.

#### 4.4. Factors affecting the performance of road construction project Under Ethiopian roads administration in the case of Bahirdar–Tisesat design and build road project

##### 4.4.1. Effects of time

##### 4.4.1.1. Client perspective

Table 8. Relative importance index and rank of time factor from the client perspective

Client	Mean	Sum	RII	Rank
Financial problem (delayed payments, financial difficulties and economic problems)	4.33	208	0.866667	2
lack of coordination with Contractors	3.06	147	0.6125	8
Slow decision making (Delay in decision making)	3.54	170	0.708333	5
Contract scope change/modification	3.94	189	0.7875	4
Right of way problem (client unable to clear construction site on time)	4.50	216	0.9	1
Inadequate planning	3.35	161	0.670833	6
Delay in effective Contractor's payment	4.08	196	0.816667	3
Lack of coordination with local authorities	3.21	154	0.641667	7

Source: Own Survey

Table 4.5. The findings show that Financial problem (delayed payments, financial difficulties and economic problems) came in second, with a RII of 0.866667. This outcome highlights how important it is to solve financial issues in order to finish the project on schedule. (Dachasa, 2022) stated that financial issues (such as late payments, cash flow issues, and economic challenges) lead to controversies amongst project participants and further delay the completion date.

Respondent first identified the right of way issue (client's inability to leave the construction site on time), with a RII of 0.9. This finding suggests that the client's (Mubila et al., 2014) inability to take control of the construction site speedily for the contractor has a major influence on the road project's timeliness.

With a RII of 0.816667, Delay in effective Contractor's payment came in third. This finding suggests that the time performance of the road projects has been significantly impacted by the delay in implementing the contractor's payment. The project couldn't be finished on schedule if the contractor's effective payment was delayed. This results in delayed project activity.

Respondents ranked contract scope changes and modifications fourth, with a RII of 0.708333. This suggests that one aspect of time performance in accomplishing road project is contract scope alteration or modification (Osman, 2019). The project's timeliness was significantly impacted by a change or modification to the contract's scope.

"Slow decision making (Delay in decision making)" with RII of 0.708333 was ranked fifth, highlighting its significant impact on project timelines. This indicates that delays (Egila et al., 2020) in decision making are a major contributor to project delays, directly affecting the completion date. Effective and timely decision-making processes are crucial for maintaining project schedules and avoiding extended durations.

Respondents ranked "Inadequate planning" sixth, with an RII of 0.670833. This emphasize its importance as a critical factor affecting project performance. Inadequate planning (Bhaskar Londhe et al., 2022) can lead to numerous issues, such as resource shortages, scheduling conflicts, and unforeseen obstacles, all of which can significantly hinder the progress and efficiency of a project. Proper and thorough planning is essential to ensure that resources are allocated appropriately, timelines are realistic, and potential risks are identified and mitigated.

Respondents ranked "Lack of coordination with local authorities" seventh, with an RII of 0.641667. This indicates that insufficient collaboration with local authorities is a notable factor impacting project performance. Effective coordination with local authorities is crucial for navigating regulatory requirements, obtaining necessary permits, and ensuring community support. Lack of coordination can lead to delays, increased costs, and potential conflicts, all of which can negatively affect the project's progress and successful completion.

“Lack of coordination with contractors” was ranked eighth, with an RII of 0.6125. This highlights that poor coordination between project managers and contractors is a significant factor impacting project performance. Effective collaboration and communication with contractors (Khattari et al., 2016) are essential to ensure that project activities are carried out smoothly and according to plan. Lack of coordination can lead to misunderstandings, delays, quality issues, and increased costs, all of which can detrimentally affect the overall success of the project.

#### 4.4.1.2. Contractor Perspective

Table 9. Relative importance index and rank of time factor from the contractor perspective

Contactor	Mean	Sum	RII	Rank
Lack of experience	2.94	141	0.5875	10
Delay in mobilization	3.63	174	0.725	1
poor site management	3.23	155	0.645833	6
Shortage of machinery and equipment on market	3.42	165	0.6875	3
Delay in delivery of construction materials to site	3.33	160	0.666667	4
Shortage of materials on site	3.25	156	0.65	5
lack of capable subcontractor’s skills	3.04	146	0.608333	9
coordination problems with others	3.21	154	0.641667	8
financial problems (Cash flow problem)	3.54	170	0.708333	2
Shortage and low productivity of labor	3.23	155	0.645833	6
Design Problem	2.85	137	0.570833	11

Source: Own Survey

Lack of experience” was ranked tenth, with an RII of 0.5875. This indicates that insufficient experience (Adhikari, 2018) among project team members is a significant factor affecting project performance. Lack of experience can lead to poor decision-making, inadequate problem-solving and inefficient execution of project tasks. Ensuring that the project team has the necessary experience and expertise is crucial for navigating challenges and achieving project objectives effectively.

Respondents ranked “Delay in mobilization” first, with an RII of 0.725. This highlights that delays in mobilizing resources, equipment, and personnel to the project site are seen as the most critical factor impacting project performance. Effective and timely mobilization is crucial for maintaining project schedules and ensuring that work can commence as planned. Delays in this area can lead to significant setbacks, increased costs, and a prolonged project timeline.

Respondents ranked “poor site management” sixth, with an RII of 0.645833. This indicates that ineffective management of the construction site is a significant factor impacting project performance (W. N. W. Ismail et al., 2019). Poor site management can lead to issues such as disorganization, safety hazards, resource misallocation, and delays, all of which can hinder the smooth progress and successful completion of a project. Effective site management is essential for maintaining order, ensuring safety, and optimizing the use of resources.

Respondents ranked “Shortage of machinery and equipment on the market” third, with an RII of 0.6875. This indicates that the unavailability of necessary machinery and equipment is a critical factor impacting project performance (Starnes et al., 2001). A shortage in this area can cause significant delays, increase costs, and reduce the efficiency of project execution. Ensuring timely access to required machinery and equipment is crucial for maintaining project schedules and achieving project objectives.

Respondents ranked “Delay in delivery of construction materials to site” fourth, with an RII of 0.666667. This indicates that delays in getting materials to the construction site are a significant factor impacting project performance. (Koblyakova et al., 2013) Justified that timely delivery of materials is crucial for ensuring that work can proceed without interruptions. Delays in material delivery can lead to schedule setbacks, increased costs, and inefficiencies in project execution.

Respondents ranked “Shortage of materials on site” fifth, with an RII of 0.65. This highlights that having insufficient materials available at the construction site is a key factor affecting project performance. A shortage of materials (Ali et al.,2021) can lead to work stoppages, delays, and increased costs, as it disrupts the construction schedule and can impact the quality of work. Ensuring that materials are adequately stocked and available as needed is essential for maintaining project efficiency and meeting deadlines.

Respondents ranked “Lack of capable subcontractor skills” ninth, with an RII of 0.608333. This indicates that insufficient skills among subcontractors are a significant factor affecting project performance. When subcontractors lack the necessary skills and expertise, it can lead to subpar work quality, delays, and additional costs. Ensuring that subcontractors (Ulubeyli et al., 2017) are highly skilled and competent is crucial for achieving project goals and maintaining overall quality and efficiency

Respondents ranked “Coordination problems with others” eighth, with an RII of 0.641667. This suggests that issues with coordinating activities and communication among various stakeholders are a notable factor affecting project performance. Effective coordination is crucial for ensuring that all parties are aligned and that project activities proceed smoothly. Coordination problems can lead to misunderstandings, delays, and inefficiencies, impacting the overall success of the project.

Respondents ranked “Financial problems (Cash flow problems)” second, with an RII of 0.708333. This highlights that cash flow issues are a major factor impacting project performance. Financial problems can disrupt the smooth progress of a project by causing delays in payments, affecting procurement, and leading to resource shortages. Managing cash flow effectively is crucial for maintaining project timelines, ensuring supplier and subcontractor payments, and keeping the project on track.

Respondents ranked “Shortage and low productivity of labor” sixth, with an RII of 0.645833. This suggests that issues related to insufficient labor and low productivity are significant factors affecting project performance. Shortages of skilled labor (Olbrich, 2014) can lead to delays and reduced efficiency, while low productivity can impact project timelines and quality. Addressing

these issues by improving labor availability and productivity is crucial for achieving project success.

Respondents ranked “Design Problem” eleventh, with an RII of 0.570833. This indicates that design issues are considered a less critical factor compared to others impacting project performance. However, even though it ranks lower, addressing design problems (Kalsaas et al., 2018) is still important, as they can affect the overall quality, functionality, and execution of the Project. Ensuring thorough and accurate design processes can help prevent issues that might arise during construction.

#### 4.4.1.3. Consultant perspective

Table 10. Relative importance index and rank of time factor from the consultant perspective

Consultant	Mean	Sum	RII	Rank
Lack of experience on the part of the consultant’s site staff.	2.83	136	0.566667	5
Poor supervision and slowness to give instruction	2.96	142	0.591667	4
incomplete documents	3.10	149	0.620833	3
absence on site	3.13	150	0.625	2
delayed and slow supervision in making decisions	3.27	157	0.654167	1

Source: Own Survey

Respondents ranked “Lack of experience on the part of the consultant’s site staff” fifth, with an RII of 0.566667. This highlights that insufficient experience among the consultant's site staff is seen as a significant factor affecting project performance. Experienced consultants (Schiess et al., 2006) are crucial for providing effective oversight, ensuring quality, and addressing issues that arise during construction. Addressing experience gaps in the consulting team can help improve project outcomes and reduce potential challenges.

“Poor supervision and slowness to give instruction” was ranked fourth, with an RII of 0.591667. This indicates that inadequate supervision and delayed instructions are considered significant factors affecting project performance. (Dalibi, 2016) Justified that effective supervision and

timely instructions are crucial for maintaining project momentum, ensuring tasks are completed correctly, and addressing issues as they arise. Addressing these issues can help improve overall project efficiency and success

“Incomplete documents” was third, with an RII of 0.620833. This indicates that issues with incomplete documentation are a significant factor impacting project performance. (Horak et al., 2018) stated that complete or insufficient documentation can lead to misunderstandings, errors, and delays, as it can hinder the clear communication of project requirements and expectations. Ensuring that all documents are complete and accurate is essential for smooth project execution and successful outcomes.

“Absence on site” was ranked second, with an RII of 0.625. This highlights that the absence of key personnel on site is considered a major factor affecting project performance. When essential team members or stakeholders are not present on site, it can lead to delays, miscommunication, and inefficiencies (Meding, 2012). Ensuring that key individuals are consistently available and present at the site is crucial for maintaining project progress and addressing issues promptly.

Respondents ranked “Delayed and slow supervision in making decisions” first, with an RII of 0.654167. This indicates that slow decision-making and delayed supervision are viewed as the most critical factors impacting project performance (Anysz et al., 2021). Effective and timely supervision and decision-making are crucial for maintaining project momentum, addressing issues quickly, and ensuring that project activities proceed as planned.

#### 4.4.2. Effects of Cost

Table 11. Relative importance index and rank of cost factor

Cost factor	Mean	Sum	RII	Rank
Additional works and design changes	4.13	199	0.829167	1
Extended duration of the contract due to various reason	4.12	198	0.825	2
Material, machinery and labor cost increment	4.06	195	0.8125	3
Inaccuracy of material take-off and estimation.);	3.19	153	0.6375	4
Inadequate pre-planning	3.15	151	0.629167	5
Fraudulent practices	2.67	128	0.533333	7
Poor site and resource management and utilization	3.08	148	0.616667	6

Source: Own Survey

Respondents ranked “Additional works and design changes” first, with an RII of 0.829167. This indicates that changes to the scope of work and design modifications are viewed as the most critical factor affecting project performance. Frequent or significant changes can lead to delays, increased costs, and complexity in project execution (Muhamad & Mohammad, 2018). Managing scope changes effectively and ensuring that design modifications are well-planned and communicated is essential for maintaining project stability and achieving successful outcomes.

“Extended duration of the contract due to various reasons” was ranked second, with an RII of 0.829167. This highlights that contract extensions, driven by multiple factors, are viewed as a major issue affecting project performance. As (Lundkvist, 2011) stated extended durations can lead to increased costs, resource allocation challenges, and potential disruptions in project schedules. Addressing the causes of contract extensions and managing project timelines effectively are crucial for mitigating these impacts and ensuring successful project completion.

“Material, machinery, and labor cost increment” was third, with an RII of 0.8125. This indicates that increases in the costs of materials, machinery, and labor are considered a significant factor impacting project performance. Rising costs can strain budgets, lead to financial challenges, and affect overall project feasibility (Alanazi et al., 2022). Effective cost management and budgeting are essential to handle these increments and maintain project financial health.

Respondents ranked “Inaccuracy of material take-off and estimation” fourth, with an RII of 0.6375. This indicates that errors in estimating material quantities and costs are a significant factor affecting project performance (Zekan, 2019). Inaccurate take-offs and estimates can lead to budget overruns, resource shortages, and delays. Ensuring accurate and thorough material estimation is crucial for effective project planning and management.

“Inadequate pre-planning” was fifth, with an RII of 0.629167. This indicates that insufficient planning before the project begins is a significant factor impacting project performance. Effective pre-planning is crucial for anticipating potential issues, allocating resources efficiently, and setting realistic timelines. Inadequate pre-planning can lead to unforeseen challenges and disruptions, making thorough and strategic planning essential for successful project execution.

“Fraudulent practices” was ranked seventh, with an RII of 0.533333. This indicates that unethical or fraudulent activities are considered a notable factor affecting project performance. Fraudulent practices can undermine project integrity, lead to financial losses, and damage reputations (Ezekiel, 2023). Addressing and mitigating fraudulent behaviors through strong oversight, transparency, and ethical practices is essential for maintaining project success and integrity.

Respondents ranked “Poor site and resource management and utilization” sixth, with an RII of 0.616667. This indicates that ineffective management and utilization of site (Zilberman, 2008) resources are seen as a significant factor impacting project performance. Proper management of resources and site operations is crucial for maintaining efficiency, reducing waste, and ensuring that the project progresses smoothly. Addressing issues in this area can lead to improved project outcomes and better use of available resources.

### 4.4.3. Effects of quality

Table 12. Relative importance index and rank of quality factor

Quality factor	Mean	Sum	RII	Rank
Poor supervision works by the Consultant staff	3.58	172	0.716667	2
Less of commitment from project profession regarding quality	3.35	161	0.670833	3
Use of poor-quality material for construction	3.23	155	0.645833	4
Experience and knowledge gap from contractor's site staff	2.96	142	0.591667	8
Design problem	3.06	147	0.6125	7
Absence of quality control methods on site	2.94	141	0.5875	9
Influence on supervision team by external factors	3.12	150	0.625	6
Lack of proper work methodology	3.19	153	0.6375	5
Problems related to workmanship and quality of equipment used during pavement layer construction	3.67	176	0.733333	1

Source: Own Survey

“Poor supervision works by the Consultant staff” was ranked second, with an RII of 0.716667. This highlights that inadequate supervision by the consultant's staff is considered a major factor affecting project performance. (Wibowo et al., 2022) stated that effective supervision is essential for ensuring that work is completed according to specifications, maintaining quality, and addressing issues promptly. Improving supervision practices by consultants can significantly enhance project outcomes and prevent problems.

“Lack of commitment from project professionals regarding quality” was ranked third, with an RII of 0.670833. (Shaikh & Darade, 2016) justified that insufficient commitment to maintaining high-quality standards among project professionals is a significant factor affecting project performance. Ensuring that all team members are dedicated to quality and adhere to standards is crucial for achieving successful project outcomes and meeting client expectations.

“Use of poor-quality material for construction” was ranked fourth, with an RII of 0.645833. This indicates that using substandard materials is a significant factor impacting project performance. Poor-quality materials can lead to structural issues, increased maintenance costs, and potential safety hazards.(Su Su, 2013) justified that ensuring the use of high-quality materials is essential for maintaining the integrity and longevity of the construction project.

Respondents ranked “Experience and knowledge gap from contractor’s site staff” eighth, with an RII of 0.591667. This indicates that gaps in experience and knowledge among the contractor's site staff are considered a notable factor affecting project performance (Hasnain et al., 2018). Ensuring that site staff have the necessary expertise and understanding is crucial for effective project execution, problem-solving, and maintaining high-quality standards. Addressing these gaps can help improve overall project outcomes.

“Design problem” was ranked seventh, with an RII of 0.6125. This indicates that issues related to design are a significant factor affecting project performance. Design problems can lead to construction challenges, increased costs, and delays (Nagy & Szalai, 2020). Addressing and resolving design issues early in the project can help prevent these problems and ensure a smoother construction process.

“Absence of quality control methods on site” was ranked ninth, with an RII of 0.5875. This indicates that the lack of effective quality control methods on site is seen as a significant factor affecting project performance. Without proper quality control, there is a risk of substandard work, non-compliance with specifications, and increased need for rework. Implementing robust quality control procedures is essential for ensuring that construction work meets required standards and is completed successfully.

“Influence on supervision team by external factors” was sixth, with an RII of 0.625. This indicates that external factors affecting the supervision team are considered a significant but slightly less critical issue compared to other factors. These external influences (Anondho et al., 2019) can impact how the supervision team performs their role, so managing and mitigating these influences is important for maintaining effective project oversight and ensuring successful project execution.

Respondents ranked “Lack of proper work methodology” fifth, with an RII of 0.6375. This indicates that inadequate work methodologies are seen as a significant factor impacting project performance. Without proper methodologies, project processes may become inefficient, leading to delays and quality issues(Zekan, 2019). Ensuring the use of well-defined and effective work methodologies is essential for improving project execution and achieving successful outcomes.

“Use of poor-quality material for construction” was ranked first, with an RII of 0.733333. This suggests that the use of substandard materials is considered the most critical factor affecting project performance.(Abbasnejad, 2013) stated that poor-quality materials can lead to significant issues such as structural failures, increased maintenance costs, and safety risks. Ensuring the use of high-quality materials is essential for maintaining project integrity and achieving desired outcomes. The overall result of the three factors is shown in the table below:

Table 13. Combined mean and rank of time, cost and quality factor

Factors of performance	Combined Mean	Sum	Combine RII	Rank
Time factor	3.39	163	0.680376	2
Cost factor	3.49	167	0.697619	1
Quality Factor	3.23	155	0.646759	3

Source: Own Survey

The cost factor is seen as the most crucial performance measure for the Bahirdar-Tisesat road project, with a combined RII of 0.697619. (Pandey, 2017) also described how cost is the most significant factor in road construction project.

Time is considered the second most important factor, with a combined RII of 0.680376 having a relatively lesser impact on the Bahirdar-Tisesat road projects compared to cost. (Osman, 2019) indicates that while time performance does affect the project, it ranks second in importance. The schedule stability of construction projects influences time performance, making the time factor a significant indicator of overall project performance.

With an RII of 0.646759, quality is considered the third significant factor impacting the Bahirdar-Tisesat road project. Despite its importance in performance (Hasnain et al., 2018) evaluation, it is ranked third among the three performance measures.

#### **4.5. Challenges affecting the Bahirdar-Tisesat road project**

##### **4.5.1. Cost related challenges**

Respondents indicated that fluctuations in funding have had a critical impact on the Bahirdar-Tisesat road project's financial stability and planning. Many cited instances where delayed or reduced funds led to halted operations, adjustments in resource allocation, and prioritization of critical activities over planned project phases. Some participants noted that the project faced repeated rescheduling and reallocation of resources due to unpredictable funding. Additionally, respondents mentioned the necessity to frequently revise budgets and renegotiate with suppliers due to payment uncertainties and the fluctuating value of contracts.

The responses highlight how funding volatility severely affects both short-term and long-term planning for the project, creating challenges in maintaining steady project progress and meeting contractual obligations. The lack of financial predictability has evidently led to resource shortages and reduced workforce morale due to uncertain project timelines. This finding aligns with other studies on infrastructure projects, where unreliable funding often translates into project delays, increased costs, and diminished quality outcomes. As suggested by the respondents, more consistent and reliable funding sources could significantly enhance the ERA's ability to manage costs effectively and adhere to schedules. This study suggests the need for more stable financial arrangements, possibly involving phased funding agreements or financial reserves, to minimize the risk posed by funding fluctuations.

##### **4.5.2. Quality related challenges**

Respondents emphasized that the choice of materials significantly affects the overall quality of the Bahirdar-Tisesat road project. Many participants noted that the use of low-quality or substandard materials in some sections of the project led to early signs of deterioration, including cracks and uneven surfaces. Several respondents reported challenges in sourcing high-quality materials locally, citing a limited supply of materials that meet the required specifications. The

delays in material deliveries, coupled with the increased cost of quality materials, were frequently mentioned as key hurdles. Some respondents also highlighted the issue of counterfeit or poor-quality materials being introduced into the market, which further complicates procurement efforts.

The responses underscore the critical role that material quality plays in determining the durability and longevity of road infrastructure. The challenges of sourcing high-quality materials have direct consequences for the road project, resulting in delays, increased costs, and a compromised end product. The limited local supply and difficulty in sourcing premium materials within the required timelines have contributed to project slowdowns. This aligns with the general industry understanding that poor-quality materials can lead to significant long-term costs due to maintenance and repairs. It is apparent that improving material sourcing processes, ensuring supplier accountability, and investing in better quality control measures for materials could enhance the project's overall quality. Future road projects could benefit from exploring alternative material suppliers or enhancing local production capabilities to mitigate these challenges.

#### **4.5.3. Time related challenges**

Respondents indicated that coordination among various stakeholders, including contractors, suppliers, consultants, and project management teams, plays a crucial role in ensuring timely project completion. Many participants reported that poor coordination often led to delays, as miscommunication or conflicting priorities between stakeholders resulted in missed deadlines, rework, and inefficient resource utilization. Several respondents pointed out that delays in decision-making, caused by the slow communication between the stakeholders, exacerbated the timeline issues. In terms of improving communication, many suggested that more regular and structured meetings, along with a centralized communication platform, could help streamline the exchange of information. Additionally, better alignment of stakeholder roles and responsibilities, along with clear reporting channels, was recommended to reduce confusion and prevent delays.

The findings highlight that effective stakeholder coordination is a cornerstone of maintaining a project timeline. Delays and disruptions in communication often cause inefficiencies, leading to a domino effect that impacts the entire project's progress. This is consistent with the common

issue faced in large infrastructure projects where multiple parties are involved and timely decision-making is critical. Improving coordination through formalized communication channels, including regular check-ins and transparent reporting systems, can help mitigate these issues. By implementing better communication protocols, stakeholders can ensure that any issues are identified and addressed proactively, thus minimizing delays. This study supports the importance of strong project management practices that emphasize stakeholder engagement and clear communication as fundamental components of timely project completion.

#### 4.6. The relationship exists between time, cost and quality

Pearson’s correlation coefficient is a measure of the intensity of the linear association between variables. Correlation coefficient values range -1 to +1. The closer to 1 the correlation coefficient gets the ‘stronger’ the correlation (Case et al., 2008).

Table 14. Pearson correlations between time, cost and quality factor

Correlations		Time	Cost	Quality
Time	Pearson correlations	1	0.655	0.758
Cost	Pearson correlations	0.655	1	0.857
Quality	Pearson correlations	0.758	0.857	1

Source: Own Survey

According to table 4.11, The analysis of the relationship between time, cost, and quality in the Bahirdar-Tisesat road project reveals a very strong correlation between these factors, as evidenced by the Pearson correlation coefficients falling within the recommended intervals. This indicates a highly interconnected and interdependent relationship between these key performance measures. Specifically, the data suggests that any alterations in one factor, such as delays in the project timeline, are likely to have a corresponding effect on both cost and quality.

For example, delays in time may lead to additional costs, as contractors might need to extend labor hours or rent extra equipment to make up for lost time. Furthermore, these delays can negatively impact the quality of the work, as hurried construction processes may result in the use of inferior materials or compromised construction methods. Similarly, cost overruns often

influence the quality of the project, as financial constraints may force the use of cheaper, lower-quality materials or limit the time allocated to proper quality control procedures.

The strong relationship between these variables underscores the complexity of managing infrastructure projects, where the balance between time, cost, and quality must be carefully maintained. If one factor is mismanaged, it can lead to cascading effects on the others, compounding challenges and making it harder to deliver the project as planned. Thus, the analysis emphasizes the need for a holistic approach to project management, where time, cost, and quality are considered in tandem. Effective scheduling, budget management, and quality control practices are essential for mitigating the risks associated with these interdependent factors and ensuring successful project delivery.

This interdependence also highlights the importance of considering all three factors in decision-making and project planning. By improving one area, such as better time management or cost control, project managers can potentially improve both cost efficiency and the quality of the final product. Conversely, neglecting any of these aspects can lead to suboptimal project outcomes, further reinforcing the need for a balanced approach.

#### **4.7. Intervention strategies to maintain the performance of the project**

Several effective strategies for maintaining or improving the performance of the Bahirdar-Tisesat road project. One of the most frequently mentioned interventions was the improvement of financial management practices, which included ensuring stable and timely funding sources. Respondents noted that financial uncertainties often lead to project delays and overruns, with some emphasizing the need for pre-approved funding allocations to avoid cash flow problems during critical phases of construction.

Another common suggestion was enhancing stakeholder coordination. Many respondents highlighted that miscommunication and delays in decision-making due to a lack of clear communication channels often lead to extended project timelines. Improved coordination between contractors, project managers, and consultants was identified as a key intervention to streamline processes and keep the project on track. Several respondents suggested implementing

more frequent project meetings, clearly defined roles, and stronger alignment between stakeholders to facilitate quicker decisions.

Furthermore, respondents emphasized the importance of regular monitoring and evaluation of the project's progress. They believed that continuous tracking of time, cost, and quality through a formal monitoring system would help detect potential problems early and address them before they escalated. This strategy could potentially prevent cost overruns and delays while maintaining high standards of quality throughout the construction process.

In addition to management and monitoring, respondents stressed the need for workforce development, particularly through training programs aimed at improving the technical skills of laborers and site supervisors. Enhancing the skills of the workforce would help mitigate the effects of labor shortages, low productivity, and mistakes due to a lack of experience. Training in the use of new technologies, materials, and construction methods was suggested to improve efficiency and quality on site.

The findings from the responses highlight that maintaining road construction project performance requires a multi-faceted approach that addresses financial stability, stakeholder coordination, continuous monitoring, and workforce competence. Financial stability emerged as a critical factor in ensuring that the project progresses without unnecessary disruptions. A consistent funding flow is essential for keeping up with the procurement of materials, equipment, and labor without delays or compromises in quality. As noted by respondents, financial planning needs to be proactive, with mechanisms in place to handle potential cash flow issues.

Effective stakeholder coordination is equally essential. Without clear communication, even small issues can spiral into larger delays. The implementation of frequent check-ins and clearly defined responsibilities for each stakeholder ensures that everyone is on the same page and that decisions are made in a timely manner. In this regard, structured communication systems can greatly enhance the efficiency of the project, preventing misunderstandings and ensuring smooth collaboration.

Regular monitoring and evaluation further support the proactive approach to project management. By establishing a monitoring framework that tracks key performance indicators (KPIs) such as time, cost, and quality, project managers can ensure that problems are identified

early and solutions can be implemented before the project is significantly affected. Early detection of delays, cost overruns, or quality issues allows for corrective action, minimizing the impact on the overall timeline and budget.

Lastly, addressing workforce development through targeted training programs can have a substantial impact on the quality and timeliness of construction. By investing in the development of skills, project managers can reduce errors, rework, and improve overall efficiency. Moreover, an empowered and well-trained workforce is likely to be more motivated and productive, further enhancing the performance of the project. This approach aligns with best practices in project management, which emphasize the importance of continuous skill improvement as part of a successful project strategy.

Collectively, these interventions offer a comprehensive strategy for maintaining or improving the performance of the Bahirdar-Tisesat road project. By ensuring better financial management, fostering communication among stakeholders, conducting regular monitoring, and investing in workforce development, project managers can address the challenges that have led to delays and cost overruns, thereby improving both the process and the outcome of the road construction.

Based on the findings of your thesis on the Bahir Dar-Tisesat design and build road project within the Ethiopian Roads Administration, triangulating the results involves comparing and cross-referencing different aspects of your analysis. Here is a triangulated interpretation that integrates various sources, methods, and theoretical perspectives:

#### **4.8. Triangulated Analysis of Bahirdar Tiseast Road Construction Project Performance**

This study's findings are triangulated through multiple data sources, including quantitative project performance data, qualitative respondent feedback, and theoretical frameworks of project management. The quantitative analysis conducted via SPSS revealed that cost is the most significant factor impacting the project's performance, with notable budget overruns often delaying project completion. Respondents, in their interviews and surveys, echoed this concern, highlighting fluctuations in funding as a major issue leading to financial constraints and resource strain. This convergence between statistical analysis and qualitative insights underscores the need for improved financial management practices, such as better budgeting, financial oversight, and contingency planning to mitigate these delays and inefficiencies.

The second major finding from the SPSS analysis was the impact of time on project performance, specifically delays in mobilization, procurement, and site preparation. These delays were also highlighted by respondents, who pointed out that poor stakeholder coordination and inefficient project management contributed significantly to these setbacks. This alignment between quantitative time metrics and qualitative feedback suggests that addressing logistical inefficiencies and enhancing scheduling methods could significantly improve project timelines. In terms of quality, while it was ranked third in the SPSS analysis, respondents stressed the importance of quality control and site management, identifying deficiencies that hindered construction standards. This aligns with the statistical findings indicating that site management practices directly correlate with the project's overall quality outcomes. The need for stronger quality assurance processes is thus confirmed both by statistical data and by qualitative insights from project stakeholders.

The triangulation of these results is further enriched by drawing on project management theory, which emphasizes the interdependence of cost, time, and quality in successful project delivery. By refining these areas and addressing the feedback from both the data and respondents, the study advocates for a holistic approach to project management. Recommendations include implementing more rigorous financial controls, improving stakeholder coordination, refining project scheduling methods, and strengthening quality management practices.

Furthermore, the suggestion for future research to explore external factors such as economic conditions and regulatory changes aligns with a broader theoretical perspective on the importance of environmental context in project performance. By expanding the scope of research to include these factors, the findings of this study can be triangulated with broader socio-economic and regulatory trends, providing a more comprehensive understanding of what drives successful project outcomes in road construction.

In conclusion, triangulating the quantitative data from SPSS with qualitative responses from project stakeholders and theoretical insights confirms the critical interdependencies between financial management, time scheduling, and quality assurance. Addressing these factors in a coordinated, comprehensive manner will significantly improve the performance and success of future road construction projects, particularly in challenging environments like that of Ethiopia.

## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1. General

This chapter presents the summary of the study findings, discussions, conclusions and recommendation of the research. The chapter also contains suggestions of related studies that may be carried out in the future.

#### 5.2. Conclusions

This thesis provides a comprehensive analysis of road construction project performance within the Ethiopian Roads Administration, specifically examining the Bahir Dar-Tisesat design and build road project. The study highlights that cost is the most critical factor impacting project performance, as significant budget overruns and financial constraints often delay project completion and strain resources. Effective financial management is crucial; hence, improved budgeting practices, financial oversight, and contingency planning are essential to mitigate these issues. Time emerged as the second most significant factor, with delays in mobilization, procurement, and site preparation leading to extended project timelines. Optimizing scheduling and enhancing logistical efficiency are necessary to address these delays and improve project delivery. Quality, though ranked third, is also vital, as deficiencies in site management and quality control adversely affect construction standards and project outcomes. The study emphasizes the need for robust quality assurance processes and effective site management to maintain high construction standards. Recommendations include implementing more rigorous financial controls, refining project scheduling methods, and strengthening quality management practices. Additionally, the thesis suggests that future research should investigate the influence of external factors such as economic conditions and regulatory changes on project performance. It also encourages exploring the effectiveness of various project management strategies in overcoming challenges related to cost, time, and quality. This holistic approach aims to enhance the overall performance and success of road construction projects, ensuring that similar future projects are completed efficiently and to high standards.

Respondents also highlighted that fluctuations in funding, poor material quality, and inadequate stakeholder coordination significantly impact the Bahirdar-Tisesat road project's performance, leading to delays, cost overruns, and compromised quality. They pointed out that these

challenges are further compounded by gaps in project management, resource availability, and regulatory inefficiencies. To improve outcomes, they emphasized the need for effective contingency planning, better communication, and streamlined processes. Addressing these issues holistically, they believe, will enhance project timelines, quality, and stakeholder confidence.

### **5.3. Recommendations**

The following points are the important recommendations of this study:

#### **For the Client (Ethiopian Roads Administration)**

**Improve Financial Monitoring:** The client should conduct regular financial audits and reviews to ensure effective budget control, address any financial discrepancies, and keep the project on track. Transparent financial oversight will help prevent cost overruns and ensure funds are available for timely procurement of materials and services.

**Strengthen Project Coordination:** The client should actively facilitate better coordination among stakeholders, particularly between the contractor, consultant, and other involved parties. Regular meetings and clear communication channels should be established to avoid delays and miscommunication.

**Address External Factors:** The client should closely monitor external factors such as economic fluctuations, regulatory changes, or geopolitical issues that could impact the road project. Proactively adapting to these conditions will help minimize disruptions to the project timeline and budget.

**Encourage Stakeholder Engagement:** The client should foster an inclusive approach by involving all relevant stakeholders (local communities, regulatory bodies, etc.) in the planning and execution phases. This approach will help gather valuable feedback, improve collaboration, and reduce resistance during project implementation.

**Support Future Research:** To continuously improve the road construction industry, the client should promote and fund further studies on innovative project management approaches. This can lead to more efficient strategies for managing time, cost, and quality in future projects.

## **For the Contractor**

**Optimize Scheduling:** The contractor should utilize advanced project management tools and techniques to improve scheduling, reduce delays, and streamline the mobilization and procurement process. This will allow for better time management and prevent setbacks that lead to cost overruns.

**Implement Rigorous Quality Control:** The contractor should adopt stringent quality assurance methods and conduct regular inspections to ensure high construction standards. This will prevent defects, rework, and delays related to poor quality, ensuring the project is completed on time and within budget.

**Enhance Site Management:** The contractor should focus on improving site management practices through staff training and efficient resource allocation. Ensuring high operational standards and maintaining efficiency at the construction site will minimize operational delays and improve overall productivity.

**Adopt Advanced Technology:** The contractor should incorporate modern technologies and software for better project tracking, data analysis, and communication. This approach will enhance overall project performance by ensuring accurate tracking of milestones, real-time data updates, and clear communication among all parties involved.

**Promote Risk Management:** The contractor should develop and implement a comprehensive risk management plan that identifies potential risks early on. Establishing strategies for risk mitigation will prevent delays and reduce the likelihood of costly rework due to unforeseen challenges.

## **For the Consultant**

**Improve Resource Allocation:** The consultant should ensure the optimal allocation of labor, machinery, and materials to avoid shortages and delays. Proper allocation of resources will help maintain project momentum and ensure the timely completion of the road project.

**Strengthen Project Coordination:** The consultant should play an active role in improving communication and collaboration among stakeholders. By ensuring that the project remains aligned with its goals and timelines, the consultant can help manage conflicts and resolve issues that arise during execution.

**Implement Rigorous Quality Control:** The consultant must oversee and enforce quality assurance standards to guarantee that the construction meets or exceeds the specified requirements. Regular inspections, audits, and evaluations should be conducted to monitor the project's adherence to quality norms.

**Promote Risk Management:** The consultant should work closely with the contractor and client to develop a comprehensive risk management framework. By monitoring potential risks, the consultant can provide guidance on necessary adjustments and help minimize their impact on the project's performance.

**Adopt Advanced Technology:** The consultant should recommend and facilitate the adoption of new technologies to improve project management, tracking, and decision-making. By leveraging modern tools, the consultant can help streamline communication and data sharing, enhancing the overall performance of the project.

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## ANNEX

Addis College  
Department of Construction Technology and Management  
Postgraduate Program

Dear Participant,

As part of fulfilling the requirements for a MSc. in Construction Technology and Management. I am carrying out research on the topic “Assessment on Road Construction Project Performance in Ethiopian Roads Administration [The Case of Bahirdar-Tisesat Design and Build Road Project]” at Addis College University.

It is well known that the Ethiopian Roads Administration often faces cost, time, and quality performance problems and related claims, resulting in extra time and budget requirements other than the contract cost and completion time agreed during contract signing time for a certain project due to various reasons.

Hence, the main objective of this thesis is to evaluate the road construction project's time, cost, and quality performance in the case of the Bahirdar-Tisesat Design and Build Road Project from the viewpoints of the Client, Consultant, and Contractor. Thus, your cooperation is crucial for its successful completion, and please notes that the information you provided will be used for academic research purposes only and accessed by the researcher alone with strict confidentiality.

As a result, kindly assist me by responding to all as per the instructions indicated, only with an accurate answer. Your answers are solely utilized for research purposes, and they also serve as suggestions for future improvements to comparable works. I want to express my gratitude in advance for your valuable time and cooperation.

Sincerely Yours,

Arsema Workagegn

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## **PART ONE: GENERAL BACKGROUND INFORMATION**

### **1. Which of the stakeholder are you?**

Client  Consultant   
Contractor  Others

### **2. Your Gender**

Male  Female

### **3. Higher Academic Qualification**

College Diploma  BA/BSc Degree   
MA/MBA/MSC  PHD   
Other (please state) -----

### **4. Which position in the project has been involved in?**

Junior Engineer  Senior Engineer   
Construction Engineer  Lead Engineer   
Team Leader  Office Engineer   
Project Manager  Resident Engineer   
Other

### **5. Relevant working experience (years):**

Less than 3 yrs.  3-8 yrs.   
9-12 yrs.  12 and above years

**PART TWO:** here is some closed - ended questions focused specially on factors that affect performance of the Bahirdar-Tisesat design and build road project in terms of cost, quality and

The questionnaire aims to assess the factors that contribute to time (delay), cost, and quality-affecting measures.

Please indicate the significance of each factor by ticking (√) in the appropriate boxes. Add any remarks relating to each factor on the last column e.g. as to the reasons, the critical factors or the solutions.

- Strongly Disagree            1
- Disagree                        2
- Slightly Disagree            3
- Agree                             4
- Strongly agree                5

**A. Factors which affect time (schedule)**

No.	Project type- DB (Design-Build)	Pease use a tick (√) mark on the appropriate point (only one)				
	Causes(factors) for time (schedule) in road project	1	2	3	4	5
1.	The factors that related to <b>owner's</b> responsibility					
1.1	Financial problem (delayed payments, financial difficulties and economic problems)					
1.2	lack of coordination with Contractors					
1.3	Slow decision making (Delay in decision making)					
1.4	Contract scope change/modification					
1.5	Right of way problem (client unable to clear construction site on time)					
1.6	Inadequate planning					
1.7	Delay in effecting Contractor's payment					

1.8	Lack of coordination with local authorities					
<b>2.</b>	Factors that related to <b>contractor's</b> responsibility					
2.1	Lack of experience					
2.2	Delay in mobilization					
2.3	poor site management					
2.4	Shortage of machinery and equipment on market					
2.5	Delay in delivery of construction materials to site					
2.6	Shortage of materials on site					
2.7	lack of capable subcontractor's skills					
2.8	coordination problems with others;					
2.9	financial problems (Cash flow problem)					
2.10	Shortage and low productivity of labor					
2.11	Design Problem					
<b>3</b>	The factors that related to <b>consultant's</b> responsibility					
3.1	Lack of experience on the part of the consultant's site staff.					
3.2	Poor supervision and slowness to give instruction					
3.3	incomplete documents					
3.4	absence on site					
3.5	delayed and slow supervision in making decisions					

## B. Factors which affect cost

No.	Project type- DB (Design-Build)	Pease use a tick (√) mark on the appropriate point (only one)				
	Causes(factors) for cost in road project	1	2	3	4	5
1	Additional works and design changes					
2	Extended duration of the contract due to various reason					
3	Material, machinery and labor cost increment					
4	Inaccuracy of material take-off and estimation					
5	Inadequate pre-planning					
6	Fraudulent practices					
7	Poor site and resource management and utilization					

## C. Factors which affect quality

No.	Project type- DB (Design-Build)	Pease use a tick (√) mark on the appropriate point (only one)				
	Factors which affect quality	1	2	3	4	5
1	Poor supervision works by the Consultant staff					
2	Less of commitment from project profession regarding quality					
3	Use of poor-quality material for construction					
4	Experience and knowledge gap from contractor's site staff					
5	Design problem					
6	Absence of quality control methods on site					
7	Influence on supervision team by external factors					

8	Lack of proper work methodology					
9	Problems related to workmanship and quality of equipment used during pavement layer construction					

**PART THREE:** Here is some open-ended questions focused specially on cost, quality and time challenge's affecting the Bahirdar-Tisesat design and build road project.

1. How do fluctuations in funding sources impact the financial planning and execution of the Bahirdar-Tisesat road project?

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2. How does the choice of materials affect the overall quality of the road project, and what challenges have been encountered in sourcing high-quality materials?

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3. In what ways does coordination among different stakeholders affect the timeline completion of the road project, and how can communication be improved?

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