Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa City Road Authority.

Aklilu Shiferaw Tadesse

A Thesis Submitted to the department of civil engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Construction Engineering and Management.

Office of Graduate Studies

Adama Science and Technology University

May, 2025

Adama, Ethiopia

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Advisor:

Bahiru Bewket Mitikie (PhD)

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DECLARATION

I, Aklilu Shiferaw, declare that this Master thesis entitled "Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa City Road Authority." is my original work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

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I/we, the advisor(s) of this thesis, hereby certify that I/we have read the revised version of the thesis entitled **"**Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa City Road Authority." prepared under my/our guidance by Aklilu Shiferaw submitted in partial fulfillment of the requirements for the degree of Mater's of Science in Construction Engineering and Management.

Therefore, I/we recommend the submission of revised version of the thesis to the department following the applicable procedures.

Bahir Bewket Mitikie (PhD)_____	_____	_____
Major Advisor/Supervisor	Signature	Date
_____	_____	_____
Co-Advisor/Co-Supervisor	Signature	Date

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I/we, the advisors of the thesis entitled "Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa City Road Authority." and developed by Aklilu Shfera, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

Bahiru Bewket Mitikie(PhD)	_____	_____
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_____	_____	_____
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We, the undersigned, members of the Board of Examiners of the thesis by Aklilu Shiferaw have read and evaluated the thesis entitled "Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa City Road Authority." and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Construction Engineering and Management.

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ACRONYMS

AACRA	Addis Ababa City Road Authority
PM	Project Management
PMP	Project Management Practices
PL	Project Planning
RM	Risk Management
RA	Resource Allocation
CM	Communication Management
HRM	Human Resource Management
M&E	Monitoring and Evaluation
PS	Procurement Strategies
TC	Timely Completion
BA	Budget Adherence
QS	Quality Standards
KPI	Key Performance Indicator
WBS	Work Breakdown Structure
QA/QC	Quality Assurance / Quality Control

ABSTRACT

This study examines the effect of project management practices on the efficiency of road projects implemented by the Addis Ababa City Road Authority. The study focuses on seven core project management practices: Planning, Risk Management, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication, and Stakeholder Engagement. Project efficiency is measured using three outcome indicators: Timely Completion, Budget Adherence, and Quality Standards. A quantitative approach was used. Data were collected from 200 respondents using a structured questionnaire. Descriptive statistics, Pearson correlation, and multiple linear regression were applied to analyze the data. The findings revealed that all seven project management practices have a positive and statistically significant effect on project efficiency. Regression results showed that Risk Management increased on-time completion by 41% ($\beta = 0.41$, $p < 0.05$) and Planning by 32% ($\beta = 0.32$, $p < 0.05$). Cost Management improved budget adherence by 45% ($\beta = 0.45$, $p < 0.01$). Monitoring and Evaluation raised quality standards by 48% ($\beta = 0.48$, $p < 0.01$). The study concludes that integrated and consistently applied project management practices are vital for improving road project outcomes in Addis Ababa. The findings emphasize the need for AACRA and its stakeholders to institutionalize structured planning, proactive risk management, and continuous performance monitoring to mitigate delays, control costs, and ensure quality. Based on the findings, the study recommends that AACRA enhance capacity-building programs targeting project planning and evaluation, adopt digital project management tools to support real-time monitoring, and establish formal stakeholder engagement frameworks to ensure inclusive decision-making. These measures would contribute to more efficient and sustainable delivery of urban road infrastructure projects in Addis Ababa.

Keywords: Project Management Practices, Timely Completion, Budget Adherence, Quality Standards, Addis Ababa City Road Authority, Road Project Efficiency.

CHAPTER ONE

INTRODUCTION

1.1 Background of The Study

Road infrastructure is a critical component of urban development, serving as the backbone for economic growth, social integration, and accessibility. Efficient road networks are indispensable for facilitating trade, reducing travel time, and enhancing connectivity, especially in rapidly growing urban centers such as Addis Ababa, Ethiopia's capital and largest city. In recent years, Addis Ababa has experienced significant urban expansion, increasing the demand for well-planned and properly executed road infrastructure. The Addis Ababa Road Authority (AACRA), tasked with the development and maintenance of the city's road networks, has made notable investments to address these needs. However, despite these efforts, the city's road projects often face critical challenges, including delays, budget overruns, and quality deficiencies. Such inefficiencies not only increase project costs but also hinder the socioeconomic benefits that these infrastructure developments are intended to deliver.

The global significance of project management practices in enhancing infrastructure efficiency is well-documented. For example, Kerzner (2017) emphasizes that effective project management methodologies significantly improve cost control, time management, and quality outcomes in infrastructure projects worldwide. However, in Ethiopia, the road construction sector continues to grapple with persistent inefficiencies that limit its potential impact. Studies conducted in Ethiopia have demonstrated that inefficiencies in project execution are often linked to systemic issues such as inadequate planning, poor resource allocation, and insufficient stakeholder involvement. For instance, a study by Abebe and Belay (2020) highlighted that weak project monitoring and evaluation systems are among the primary causes of delays in Ethiopian road projects. Similarly, Getachew (2019) examined the influence of stakeholder management on project performance and found that limited engagement with stakeholders frequently results in conflicts and project disruptions. These findings provide a foundational understanding of the problem and illustrate the need for targeted research to address these challenges.

In Ethiopia, the efficiency of road construction projects has attracted the attention of scholars who seek to understand the underlying causes of these challenges. Abebe and Belay (2020) conducted

a study focusing on project monitoring and evaluation practices in Ethiopian road construction and identified insufficient oversight and lack of structured monitoring frameworks as significant contributors to project delays and cost overruns. Their findings emphasized the need for systematic and consistent evaluation practices to enhance project outcomes. Similarly, Tsegaye (2021) examined risk management practices in the sector and revealed that inadequate risk assessment and mitigation strategies often result in inefficiencies, particularly in urban road projects. Desta (2019), in a related study, explored resource allocation challenges in Ethiopian urban infrastructure projects and highlighted the recurring issue of mismanaged resources, which frequently leads to project delays and compromised quality. While these studies provide valuable insights into various aspects of road construction challenges, they fall short of specifically addressing the project management practices employed by AACRA in the unique and complex environment of Addis Ababa's urban road networks.

The gap in existing literature—both locally and internationally—calls for a focused study on the impact of project management practices on road project efficiency within the AACRA. This research aims to bridge this gap by assessing the current project management practices employed by AACRA, identifying areas for improvement, and providing actionable recommendations tailored to the urban construction context of Addis Ababa. By integrating lessons from both local studies and international best practices, this study contributes to the broader body of knowledge in construction engineering and management, offering insights for researchers and practitioners seeking to enhance project outcomes in Ethiopia and similar contexts.

1.2 Statement of the Problem

The road construction sector in Addis Ababa, Ethiopia, plays a pivotal role in the city's socio-economic development. Roads improve connectivity, reduce transportation costs, and support urban industries by facilitating the movement of goods and services. Despite these benefits, road construction projects under the Addis Ababa Road Authority (AACRA) often face persistent challenges, including frequent delays, budget overruns, and substandard quality. These challenges not only hinder the timely delivery of infrastructure but also compromise the overall efficiency and sustainability of the sector. Studies conducted locally and globally have emphasized the importance of project management practices in addressing these issues. However, a clear

understanding of how these practices influence project efficiency within the specific context of AACRA remains limited.

Existing research highlights critical gaps in the application and effectiveness of project management methodologies in Ethiopian road projects, particularly those managed by AACRA. For instance, Abebe and Belay (2020) identified weak project monitoring and evaluation systems as a major contributor to inefficiencies in project execution. While this study provided valuable insights, it did not specifically address the unique operational challenges faced by AACRA. Similarly, Tsegaye (2021) explored the implementation of risk management practices in road projects but noted that their application under AACRA is often inconsistent and reactive rather than proactive. These findings suggest a significant gap in the systematic application of project management tools and techniques to enhance project outcomes in the context of AACRA.

Moreover, international research offers insights that have yet to be fully explored in Addis Ababa's road projects. Kerzner (2017) emphasized that effective project management methodologies, including detailed planning, stakeholder engagement, and continuous risk assessment, are crucial for achieving project efficiency. While these approaches are widely recognized in global practice, their adaptation and integration into AACRA-managed road construction projects remain under-researched. This gap underscores the need for localized studies that adapt international best practices to the unique challenges of urban road construction in Addis Ababa.

Theoretical frameworks such as the Project Management Body of Knowledge (PMBOK) guide and Turner's (2016) project management theories offer valuable lenses for examining these issues. These frameworks emphasize the importance of structured methodologies in managing time, cost, and quality constraints. However, their practical application within AACRA's projects has not been adequately studied, leaving a gap in understanding how these theories can be effectively implemented to address local challenges. For example, Getachew (2019) discussed stakeholder management's role in project success but did not explore its integration with other critical project management practices within Addis Ababa's urban context.

This study aims to address these gaps by investigating the impact of project management practices on road project efficiency under the Addis Ababa Road Authority. By situating the research within the context of established theoretical frameworks and addressing the specific challenges identified in prior studies, this research seeks to provide actionable insights for improving project outcomes.

The findings are expected to contribute to the broader body of knowledge in construction engineering and management while offering practical recommendations for researchers interested in advancing this field.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study was to assess the impact of project management practices on road project efficiency in Addis Ababa, with a focus on projects managed by the Addis Ababa Road Authority (AACRA).

1.3.2 Specific Objectives

To achieve the general objective, the study focused on the following specific objectives:

1. To assess the current state of project management practices employed by the Addis Ababa Road Authority (AACRA) in road construction projects.
2. To investigate the relationship between specific project management practices (Planning Practices, Risk Management Practices, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication Practices, and Stakeholder Engagement Practices) and key performance indicators (Timely Completion, Budget Adherence, and Quality Standards) of road projects.
3. To develop a framework of best practices and recommendations for enhancing project management processes and improving the efficiency of road construction projects within AACRA.

1.4 Major Research Questions

1. What were the key strengths and weaknesses of the project management system implemented by AACRA in road construction projects?
2. How did key project management practices (Planning Practices, Risk Management Practices, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication Practices, and Stakeholder Engagement Practices) impact the timely completion, budget adherence, and quality of road construction projects within AACRA?

3. What specific recommendations could be made for improving project management practices within AACRA to enhance the efficiency and effectiveness of road construction projects?

1.5 Significance of the Study

This study was valuable because it addressed an important gap in understanding how project management practices influenced the efficiency of road construction projects in Addis Ababa. Road infrastructure played a critical role in supporting economic growth and improving urban mobility, but inefficiencies such as delays, cost overruns, and poor quality often reduced the expected benefits. By focusing on the practices of the Addis Ababa Road Authority (AACRA), this research provided insights that were directly relevant to urban road construction in Ethiopia.

One of the key contributions of this study was its potential to guide future research. By analyzing how specific project management practices such as planning, risk management, resource allocation, and monitoring impacted project outcomes, the research added to the growing body of knowledge in construction engineering and management. It served as a foundation for researchers interested in exploring similar challenges in other urban settings or sectors.

In addition, the findings of this study helped identify practical solutions for improving project efficiency. For instance, by highlighting best practices or identifying gaps in current methods, the study contributed to developing strategies that enhanced the timely and cost-effective delivery of road projects. This, in turn, supported better resource utilization and strengthened the capacity of organizations like AACRA to meet the growing demand for infrastructure.

Ultimately, this research was not just theoretical; it aimed to solve real-world problems. By addressing inefficiencies in road construction projects, it supported broader efforts to improve urban mobility and development in Addis Ababa, making it a valuable resource for anyone interested in the intersection of project management and infrastructure development.

1.6 Scope and Limitation of the Study

This study focused on examining the impact of project management practices on the efficiency of road construction projects administered by the Addis Ababa Road Authority (AACRA). Geographically, the scope was limited to urban road projects within Addis Ababa, excluding rural or regional road projects and those managed by other government or private entities. The study

concentrated on seven core project management practices planning, risk management, resource allocation, monitoring and evaluation, cost management, communication, and stakeholder engagement and their influence on three key dimensions of project efficiency: timely completion, budget adherence, and quality standards.

The study targeted Client (AACRA/Client, Team Leader, Contract Administration, Supervisor, etc), Consultants (Resident Engineers), Contractors (Project Managers, Site Engineers), Stakeholders (Government Officials, Community, Suppliers). Data were collected through structured questionnaires providing quantitative insights into the current practices and performance outcomes.

Despite its strengths, the study encountered several limitations. First, the reliance on self-reported data may have introduced response bias, despite efforts to ensure anonymity and objectivity. second, while the study employed statistical tools to analyze relationships between variables, it did not conduct a longitudinal analysis to observe changes over time. Lastly, access to complete and up-to-date project records was limited, which may have affected the accuracy of some assessments.

Notwithstanding these limitations, the study provides valuable insights into project management practices within AACRA and offers practical recommendations for improving project efficiency in urban infrastructure development.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction to Key Theories and Concepts

2.1.1 Theories of Project Management Practices

Project management practices are built on various theories and frameworks that have evolved to address the challenges of managing diverse projects. This section elaborates on three key theoretical approaches: Classical Project Management Theory, Modern Project Management Approaches, and the Project Management Body of Knowledge (PMBOK). These theories provide the foundation for critical project management practices, including planning, risk management, monitoring, and evaluation.

Classical Project Management Theory

Classical Project Management Theory is one of the earliest approaches to organizing and managing projects. It emphasizes a structured and systematic process, where each phase of the project—initiation, planning, execution, monitoring, and closure—is executed in a linear sequence. The theory assumes that projects can be broken down into smaller, manageable tasks and that careful planning is essential for success.

One of the key principles of classical project management is the "iron triangle," which highlights the interdependence of scope, time, and cost. Nicholas and Steyn (2020) explain that this approach focuses on achieving clearly defined objectives by managing these three constraints effectively. For instance, in construction projects, detailed schedules and budgets are created upfront, and teams work to ensure that activities align with these plans.

While classical project management is highly effective in projects with well-defined goals and stable requirements, it has limitations in dynamic environments. It struggles to adapt to changes once the project is underway, making it less suitable for projects requiring iterative processes. Nonetheless, the theory remains a cornerstone for projects where predictability and control are paramount, such as infrastructure development and large-scale construction (Kerzner, 2021).

Modern Project Management Approaches

Modern project management approaches evolved to address the shortcomings of classical theories, particularly in handling complex and dynamic projects. These approaches introduce flexibility, adaptability, and a stronger focus on collaboration. Two prominent modern approaches are Agile and Lean Construction, which have been widely adopted in diverse industries.

Agile project management emphasizes iterative progress and continuous feedback. It is particularly suited for projects with rapidly changing requirements, such as software development. Larson and Gray (2021) describe Agile as a framework that prioritizes stakeholder involvement and frequent reassessment of project deliverables, enabling teams to adjust to emerging challenges. For example, in road construction projects, Agile principles can be applied to manage stakeholder inputs and make adjustments based on environmental or regulatory changes.

Lean Construction, on the other hand, focuses on minimizing waste and optimizing efficiency. This approach is rooted in Lean Manufacturing principles and aims to streamline workflows while maintaining quality. According to Koskela et al. (2019), Lean Construction is highly relevant to the construction sector, where inefficiencies such as material wastage and delays are common. By using tools like value stream mapping and pull scheduling, project teams can reduce costs and improve overall project outcomes.

Modern approaches have introduced a shift from rigid, plan-driven methodologies to adaptive, people-focused frameworks. These approaches acknowledge the unpredictability of real-world projects and provide tools to navigate uncertainty effectively. This is particularly important in the Ethiopian context, where challenges such as resource constraints, regulatory hurdles, and environmental unpredictability often arise.

Project Management Body of Knowledge (PMBOK)

The Project Management Body of Knowledge (PMBOK), developed by the Project Management Institute (PMI), serves as a comprehensive guide for managing projects. Unlike traditional theories, PMBOK integrates both classical and modern project management principles, offering a holistic framework that can be applied across industries.

Risk management is one of the core aspects emphasized in PMBOK. This includes identifying potential risks, assessing their impact, and developing mitigation strategies. For example, in urban road projects, risks such as weather conditions, material shortages, and regulatory delays can significantly impact timelines. By applying PMBOK's risk management processes, project managers can proactively address these challenges and minimize disruptions.

Another critical area is monitoring and evaluation (M&E), which ensures that project progress aligns with the planned goals. PMBOK provides tools for tracking performance metrics, such as earned value analysis (EVA), which compares the actual progress to the planned schedule and budget. Nicholas and Steyn (2020) note that the use of these tools enhances transparency and accountability, which are crucial for project success in both private and public sectors.

The Role of These Theories in Practice

Each of these theories contributes unique strengths to the field of project management. Classical Project Management Theory provides a solid foundation for structured and predictable projects, while modern approaches like Agile and Lean offer flexibility and efficiency for complex, evolving projects. PMBOK serves as a bridge between these two extremes, offering a standardized framework that integrates best practices from both classical and modern methodologies.

In the context of Ethiopian road construction projects, these theories can be applied to address specific challenges. For instance, classical principles can guide initial planning and resource allocation, while Agile methods can be used to adapt to unforeseen changes. Meanwhile, PMBOK's comprehensive framework can ensure that all aspects of the project are managed cohesively, from risk assessment to stakeholder communication.

By combining insights from these theories, project managers can develop a robust approach that balances structure with adaptability, ensuring successful project outcomes in diverse settings.

2.1.2 Theories of Efficiency in Construction Projects

Efficiency in construction projects is a critical factor that determines their success. Achieving efficiency means completing projects within the allocated time, budget, and quality parameters. Several theories and methodologies have been developed to improve construction project efficiency. Among these, Lean Construction Theory and the Critical Path Method (CPM) stand out

as two widely recognized approaches. These theories provide practical strategies to optimize resources, minimize waste, and improve overall project performance.

Lean Construction Theory

Lean Construction Theory is rooted in Lean Manufacturing principles, which were originally developed by Toyota to optimize production systems. In the context of construction, this theory aims to eliminate waste, improve productivity, and deliver value to the client. According to Koskela et al. (2019), waste in construction projects often includes excess material, unnecessary waiting times, inefficient processes, and rework caused by poor quality. Lean Construction addresses these inefficiencies by emphasizing collaboration, planning, and continuous improvement.

One of the core principles of Lean Construction is the Last Planner System (LPS), which focuses on improving planning reliability and enhancing coordination among project teams. LPS encourages collaborative planning, where all stakeholders contribute to creating a realistic and achievable work plan. This approach minimizes delays and ensures that each task is ready to be executed as planned (Ballard & Tommelein, 2016). For example, in road construction projects, the use of LPS can help streamline the sequencing of tasks, ensuring that resources such as equipment and materials are available when needed.

Another important aspect of Lean Construction is the concept of value stream mapping, which involves analyzing the flow of materials and information to identify bottlenecks and inefficiencies. By visualizing the entire construction process, project teams can identify non-value-adding activities and work towards eliminating them. This results in smoother workflows and better utilization of resources (Koskela et al., 2019).

Lean Construction has been particularly effective in large-scale infrastructure projects, where complexity and coordination challenges often lead to inefficiencies. By fostering a culture of continuous improvement and collaboration, this theory provides a framework for achieving better project outcomes.

Critical Path Method (CPM)

The Critical Path Method (CPM) is another fundamental approach to improving efficiency in construction projects. CPM is a project scheduling technique that identifies the sequence of tasks that must be completed on time for the entire project to stay on schedule. This sequence of tasks, known as the "critical path," determines the project's duration. According to Kerzner (2021), CPM helps project managers prioritize activities, allocate resources effectively, and identify potential delays before they impact the overall timeline.

CPM involves breaking down the project into smaller activities, estimating the duration of each activity, and mapping their interdependencies. The result is a detailed network diagram that highlights the critical path and non-critical activities. Non-critical activities have "float" or flexibility, allowing them to be delayed without affecting the project's completion date (Nicholas & Steyn, 2020). For instance, in urban road construction, CPM can help project managers identify critical tasks such as excavation, foundation work, and asphalt laying, ensuring that these activities are given priority to avoid delays.

One of the key advantages of CPM is its ability to provide real-time updates on project progress. By regularly updating the network diagram, project managers can track performance against the planned schedule and make adjustments as needed. Kerzner (2021) notes that CPM is particularly useful in complex projects with multiple stakeholders, as it provides a clear roadmap for coordinating efforts and maintaining accountability.

However, CPM also has limitations. It assumes that activity durations are fixed and does not account for uncertainties, which are common in construction projects. To address this, project managers often combine CPM with other techniques, such as risk analysis or simulation tools, to account for variability and enhance decision-making (Larson & Gray, 2021).

Application of These Theories in Construction Projects

Both Lean Construction Theory and CPM have practical applications in the construction industry, and their combined use can significantly improve project efficiency. Lean Construction provides a framework for eliminating waste and optimizing workflows, while CPM offers a structured approach to scheduling and resource allocation. Together, these theories address both process efficiency and time management, ensuring that projects are completed successfully.

In the Ethiopian construction sector, where challenges such as resource shortages, poor coordination, and unexpected delays are common, these theories offer valuable insights. For example, applying Lean Construction principles can help reduce material wastage and improve collaboration among contractors, while CPM can be used to create realistic schedules and track progress.

By integrating these approaches, project managers can develop more resilient strategies that adapt to the unique challenges of each project. This not only enhances efficiency but also ensures that projects meet their intended objectives within the constraints of time, cost, and quality.

2.2 Review of Related Studies

2.2.1 International Empirical Studies on Project Management Practices

Effective project management practices play a critical role in improving efficiency in road construction projects. Researchers around the world have investigated how various project management tools and techniques contribute to the success of these projects. This section reviews global empirical studies that evaluate the impact of project management practices, including planning, monitoring, evaluation, and risk management, on road construction efficiency.

The Role of Project Planning in Enhancing Efficiency

Project planning has consistently been identified as a key factor in the successful execution of road construction projects. For instance, a study conducted by Banihashemi et al. (2017) explored the impact of project planning on time and cost performance in construction projects across multiple countries. The study highlighted that detailed project plans, which included accurate resource allocation and scheduling, led to a 15% reduction in project delays and cost overruns. The findings emphasized the importance of integrating project planning tools, such as Gantt charts and work breakdown structures (WBS), into the early phases of road construction projects.

Similarly, Olaniran et al. (2019) conducted research on highway construction projects in the United States and Europe. Their study revealed that projects with comprehensive planning frameworks experienced fewer interruptions caused by unforeseen site conditions or resource shortages. The researchers concluded that planning tools like the Critical Path Method (CPM) significantly improved overall project efficiency by identifying critical activities and ensuring that resources were focused on high-priority tasks.

Monitoring and Evaluation as Drivers of Efficiency

Monitoring and evaluation (M&E) practices are crucial for tracking project progress and ensuring that road construction projects stay on track. A study by Javed et al. (2019) analyzed M&E practices in road infrastructure projects in Southeast Asia. The research found that frequent monitoring using performance metrics, such as schedule adherence and budget utilization, reduced delays by 20% on average. The study also noted that the use of real-time data collection tools, such as drones and sensors, enhanced project managers' ability to make informed decisions and address potential issues proactively.

Another study by Zwikael and Meredith (2018) examined the role of project evaluation in improving construction efficiency in Australia. The researchers found that systematic evaluations conducted at different stages of the project lifecycle provided valuable insights into project performance. These evaluations allowed teams to identify inefficiencies early and implement corrective measures, resulting in better project outcomes. The study recommended adopting frameworks like the Project Management Maturity Model (PMMM) to improve evaluation practices and enhance road construction efficiency.

Risk Management and Its Impact on Efficiency

Risk management is another critical component of project management that directly affects the efficiency of road construction projects. A study by Amadi et al. (2020) focused on road construction projects in sub-Saharan Africa, highlighting how proactive risk management practices mitigated delays caused by unpredictable factors such as weather conditions and supply chain disruptions. The researchers found that projects with robust risk assessment frameworks experienced 25% fewer delays compared to those without such frameworks. Tools like risk matrices and Monte Carlo simulations were particularly effective in identifying and addressing potential risks.

Additionally, Famiyeh et al. (2017) conducted research on road infrastructure projects in the Middle East and North Africa (MENA) region. Their findings indicated that integrating risk management strategies, such as contingency planning and stakeholder risk assessments, significantly improved project outcomes. The study emphasized that involving all stakeholders in

the risk management process enhanced communication and reduced conflicts, leading to smoother project execution.

The Influence of Collaborative Project Management Practices

Collaboration among project stakeholders is essential for improving road construction efficiency. A study by Love et al. (2018) analyzed the impact of collaborative project management practices on road construction projects in the United Kingdom. The researchers found that projects emphasizing teamwork and open communication experienced fewer disputes and delays. Collaboration tools, such as cloud-based project management software, played a vital role in facilitating real-time communication and information sharing among project teams.

Furthermore, Chandra et al. (2021) examined public-private partnership (PPP) road projects in India. The study revealed that effective collaboration between government agencies and private contractors led to faster project completion and better resource utilization. The authors recommended adopting integrated project delivery (IPD) approaches to foster collaboration and improve efficiency in large-scale road construction projects.

Trends and Gaps in the Literature

While international studies highlight the importance of planning, M&E, risk management, and collaboration in road construction, certain gaps remain. For instance, many studies focus on the application of project management practices in developed countries, leaving room for further research in developing regions. Additionally, there is limited empirical evidence on the long-term sustainability of efficiency improvements achieved through these practices. Addressing these gaps can provide a more comprehensive understanding of how project management practices influence road construction efficiency globally.

2.2.2 Local Empirical Studies on Road Project Efficiency in Ethiopia

Road construction plays a significant role in Ethiopia's economic and social development. Given its importance, researchers have investigated how project management practices influence the efficiency of road construction projects across the country. This section reviews empirical studies conducted in Ethiopia, focusing on the application of planning, monitoring, evaluation, risk management, and other project management techniques.

Project Planning in Ethiopian Road Construction

Project planning is a critical element of successful road construction in Ethiopia. Teshome and Zeleke (2018) conducted a study analyzing the impact of planning on the timely delivery of road projects undertaken by the Ethiopian Roads Authority (ERA). They found that inadequate planning was a major factor contributing to delays and cost overruns. The study highlighted that the use of tools such as work breakdown structures (WBS) and Gantt charts improved the clarity of project activities, enabling better resource allocation and scheduling.

Similarly, Berhanu (2020) explored the role of planning in rural road construction projects in Ethiopia. The findings revealed that community involvement during the planning phase significantly enhanced the efficiency of project implementation. According to the study, incorporating local input helped project teams address potential challenges early, thereby reducing the likelihood of delays and rework.

Monitoring and Evaluation Practices

Monitoring and evaluation (M&E) practices are essential for tracking the progress and performance of road projects in Ethiopia. A study by Getachew and Alemu (2019) assessed the effectiveness of M&E practices in road projects funded by international donors. The researchers noted that projects with well-structured M&E frameworks experienced fewer deviations from their original timelines and budgets. They also emphasized the importance of involving independent evaluators to provide unbiased assessments of project performance.

Another study by Mesfin and Tesfaye (2021) examined M&E practices in road construction projects in Oromia. The study found that while monitoring activities were generally conducted, evaluation practices were often overlooked. This gap limited the ability of project teams to identify and address inefficiencies. The researchers recommended the adoption of digital monitoring tools to enhance the accuracy and timeliness of data collection, which would ultimately improve decision-making.

Risk Management in Ethiopian Road Projects

Risk management is a critical component of road project efficiency, especially in a country like Ethiopia, where projects are frequently exposed to risks such as weather conditions, resource shortages, and stakeholder conflicts. Abebe and Abate (2018) investigated risk management practices in road construction projects managed by the ERA. Their findings revealed that most projects lacked formal risk assessment frameworks, leading to frequent disruptions. The study recommended adopting standardized risk management processes, such as risk matrices and contingency planning, to mitigate potential challenges.

In another study, Haile and Worku (2020) focused on risk management in public-private partnership (PPP) road projects in Ethiopia. The researchers found that projects with active stakeholder involvement in risk identification and mitigation experienced better outcomes. They highlighted that clear communication and shared responsibility among stakeholders were key to minimizing project risks and ensuring efficiency.

Challenges in Project Management Practices

Despite some progress, Ethiopian road projects face numerous challenges in implementing project management practices. Ayele and Bekele (2019) analyzed the barriers to efficient road construction in Ethiopia. They identified limited technical capacity, inadequate funding, and bureaucratic delays as major obstacles. The study also pointed out that the absence of advanced project management tools hindered the effective planning, monitoring, and evaluation of projects.

Furthermore, a study by Tadesse and Solomon (2022) highlighted the impact of contractor selection on project efficiency. The researchers found that poor contractor performance, often due to limited experience or financial instability, negatively affected the timely delivery of road projects. They recommended revising procurement policies to prioritize contractors with proven track records and sufficient capacity.

Trends and Gaps in the Literature

While there is growing research on project management practices in Ethiopian road construction, significant gaps remain. Many studies focus on specific aspects of project management, such as planning or risk management, without providing a comprehensive analysis of their combined

impact on efficiency. Additionally, there is limited empirical evidence on the long-term sustainability of improvements achieved through these practices. Future research should address these gaps by adopting a holistic approach to evaluating project management practices in road construction.

2.3 Critical Analysis of Literature

2.3.1 Strengths and Weaknesses of Prior Research

This section provides a critical analysis of previous studies on project management practices and their role in improving road project efficiency. It evaluates the methodologies, findings, and limitations of these studies, highlighting areas of strength and identifying gaps that warrant further investigation.

Strengths of Prior Research

One notable strength of previous research is the diversity of methodologies used to explore project management practices. Many studies employed a combination of quantitative and qualitative approaches, which provided a well-rounded perspective. For example, Abebe and Abate (2018) used case studies and surveys to examine risk management practices in road construction projects in Ethiopia. This mixed-methods approach allowed the authors to gather detailed data while also identifying patterns across multiple projects. Such methodologies make the findings more robust and reliable.

In addition, prior research has successfully linked project management practices to measurable outcomes, such as time, cost, and quality performance. Studies like those by Getachew and Alemu (2019) on monitoring and evaluation (M&E) practices in donor-funded road projects effectively demonstrated the positive correlation between structured M&E frameworks and project efficiency. These findings provided actionable insights that practitioners and policymakers could implement to improve road project outcomes.

Moreover, some studies have highlighted innovative practices that are particularly relevant in the context of developing countries. For instance, Berhanu (2020) emphasized the importance of community involvement during the planning phase of rural road projects in Ethiopia. This approach not only enhanced project efficiency but also fostered local ownership, which is crucial for the sustainability of infrastructure projects.

Weaknesses of Prior Research

Despite these strengths, there are several weaknesses in the existing body of literature. One recurring issue is the over-reliance on self-reported data, which can introduce bias and limit the reliability of findings. For instance, in their study on risk management practices, Haile and Worku (2020) primarily used interviews with project managers as their data source. While this provided valuable insights, it lacked the triangulation needed to validate the findings, such as incorporating project documentation or observational data.

Another limitation is the narrow focus of many studies. Most research tends to concentrate on specific aspects of project management, such as planning or risk management, without examining how these practices interact. For example, while Teshome and Zeleke (2018) provided detailed insights into the role of planning in road construction efficiency, they did not address how planning integrates with M&E or risk management practices. This siloed approach leaves gaps in understanding the broader, interconnected impact of project management practices.

Furthermore, there is a lack of longitudinal studies that assess the long-term effects of project management practices on road project efficiency. Many studies, such as those by Ayele and Bekele (2019), focus on short-term outcomes like meeting project deadlines or staying within budget. However, they do not explore whether these practices contribute to sustained efficiency or improved maintenance over time.

Methodological Gaps

Methodologically, some studies suffer from small sample sizes, which limit the generalizability of their findings. For instance, Mesfin and Tesfaye (2021) examined M&E practices in Oromia's road projects but only included a handful of cases. While their analysis was detailed, the small sample size made it difficult to draw broader conclusions applicable to other regions or contexts.

Additionally, there is limited use of advanced analytical techniques in many studies. For example, studies like those by Tadesse and Solomon (2022) relied on descriptive statistics to evaluate contractor selection's impact on project efficiency. While these findings were useful, incorporating advanced statistical methods such as regression analysis or structural equation modeling could have provided deeper insights into the causal relationships between variables.

Gaps in Literature

The literature also reveals significant gaps in the exploration of technology's role in project management for road construction in Ethiopia. While global studies, such as those by Osei and Ackah (2020), have explored the use of digital tools and software in project management, Ethiopian studies have largely overlooked this area. This gap is particularly significant given the increasing availability of project management software and tools, which could transform how road projects are planned, monitored, and evaluated.

Another notable gap is the limited focus on the socio-economic impacts of efficient project management practices. Most studies concentrate on technical efficiency, such as cost and time savings, without examining how these efficiencies contribute to broader developmental goals, such as job creation or improved access to markets.

Opportunities for Future Research

Future studies could address these gaps by adopting more comprehensive and integrated approaches. For instance, examining how planning, M&E, and risk management practices collectively influence project outcomes could provide a more holistic understanding of project management efficiency. Additionally, longitudinal studies that track the long-term impact of these practices on road projects could yield valuable insights into their sustainability.

Moreover, there is a need for research that explores the role of emerging technologies, such as Geographic Information Systems (GIS) and Building Information Modeling (BIM), in enhancing road project efficiency. These tools have shown promise in global studies but remain underexplored in Ethiopia (Osei & Ackah, 2020).

2.3.2 Identification of Research Gaps

This section identifies key gaps in the existing body of literature, particularly focusing on the limited attention given to urban road projects in Ethiopia, including Addis Ababa, and the insufficient integration of specific project management practices into studies on road construction efficiency.

Lack of Focus on Urban Road Projects

Most research on road construction in Ethiopia has primarily concentrated on rural and regional roads, leaving urban road projects significantly underexplored. Urban road infrastructure presents unique challenges, such as high population density, land acquisition issues, and traffic congestion, which require distinct project management approaches. However, few studies have addressed these complexities in the Ethiopian context. For example, while Mesfin and Tesfaye (2021) examined monitoring and evaluation practices in road construction projects, their focus was predominantly on rural projects, with no specific discussion of urban areas like Addis Ababa. This gap is particularly notable given the rapid urbanization in Ethiopia and the growing demand for efficient urban road networks to support economic growth and mobility.

Additionally, studies that do touch on urban road projects often lack depth. For instance, Tadesse and Solomon (2022) briefly discussed contractor selection practices in urban projects but did not delve into the unique challenges these projects face, such as the relocation of utilities or minimizing disruptions to urban activities. This oversight creates a significant gap in understanding how project management practices can be tailored to improve the efficiency of urban road construction.

Limited Integration of Specific Project Management Practices

Another gap in the literature is the fragmented approach to studying project management practices. Many studies have focused on individual aspects of project management, such as planning, risk management, or monitoring and evaluation, without examining how these practices interact to influence project outcomes. For example, Abebe and Abate (2018) explored risk management practices in Ethiopian road construction projects but did not consider how these practices integrate with planning or monitoring activities. This siloed approach limits the ability to develop comprehensive frameworks for managing road construction projects effectively.

Moreover, the literature rarely addresses the application of advanced project management tools and technologies, such as Building Information Modeling (BIM) or Geographic Information Systems (GIS), in the Ethiopian context. Global studies, like those by Osei and Ackah (2020), have demonstrated the potential of these tools to improve project efficiency by enhancing planning accuracy and facilitating real-time monitoring. However, Ethiopian studies have yet to explore

their adoption in depth, particularly in urban road projects where such tools could be especially beneficial.

Inadequate Consideration of Stakeholder Involvement

A related gap is the insufficient attention given to the role of stakeholder involvement in urban road projects. Effective stakeholder engagement is crucial in urban settings, where projects often impact a wide range of stakeholders, including residents, businesses, and government agencies. While Berhanu (2020) highlighted the importance of community involvement in rural road projects, similar studies focused on urban contexts are lacking. For example, how do urban residents perceive road construction projects, and what mechanisms can be put in place to address their concerns? These questions remain largely unanswered in the existing literature.

Neglect of Sustainability and Maintenance

Another overlooked area is the long-term sustainability and maintenance of urban road projects. Most studies focus on the immediate outcomes of road construction, such as meeting deadlines and staying within budget, without examining how these projects are maintained over time. This is particularly concerning in urban settings, where poor maintenance can lead to rapid deterioration of roads, negating the benefits of initial investments. Ayele and Bekele (2019) pointed out this issue in rural projects but did not extend their analysis to urban areas, leaving a critical gap in understanding the sustainability of urban road infrastructure.

Limited Research on Addis Ababa

While Addis Ababa is Ethiopia's capital and largest urban center, it has received surprisingly little attention in studies on road project efficiency. The city's unique challenges, such as rapid population growth, informal settlements, and a high volume of vehicular traffic, make it an important case study for urban road construction. However, most existing research, such as the work by Getachew and Alemu (2019), focuses on other regions, leaving Addis Ababa underrepresented. This gap is significant because insights from studies on Addis Ababa could inform best practices for other rapidly urbanizing cities in Ethiopia and beyond.

Opportunities for Future Research

Addressing these gaps presents several opportunities for future studies. Researchers could focus on urban road projects in Addis Ababa, examining how specific project management practices can be adapted to address the city's unique challenges. Studies could also adopt a more integrated approach by analyzing how planning, risk management, and monitoring practices work together to influence project outcomes. Additionally, there is a need for research that explores the use of advanced tools like BIM and GIS in urban road construction projects in Ethiopia. Finally, future studies could investigate the long-term sustainability and maintenance of urban roads, providing insights into how initial investments can yield lasting benefits.

Table 2.1: Research Gaps in Urban Road Projects and Project Management Practices

Project Management Practice (IV)	Efficiency Indicators Studied (DV)	Coverage in Literature	Gap Identified
Planning Practices	Timely Completion, Budget Adherence	Commonly covered (e.g., Teshome & Zeleke, 2018)	Rarely linked to all three KPIs together; limited focus on Addis Ababa urban context
Risk Management	Timely Completion, Budget Adherence	Studied (e.g., Desta & Alemayehu, 2021)	Mostly reactive, not integrated with other PM areas
Monitoring & Evaluation	Timely Completion, Quality Standards	Moderate attention (e.g., Getachew & Alemu, 2019)	Little integration with cost efficiency
Resource Allocation	Timely Completion, Budget Adherence	Some focus (e.g., Abebe & Bekele, 2019)	No robust linkage to project quality or efficiency framework

Cost Management	Budget Adherence	Narrowly studied (e.g., Tesfaye & Mekonnen, 2020)	Not integrated with planning or M&E for full efficiency
Communication Practices	All 3 indicators	Rarely studied in Ethiopian context	Underrepresented in local studies, especially in urban projects
Stakeholder Engagement	Quality Standards, Timely Completion	Mentioned (e.g., Berhanu, 2020)	No empirical linkage to efficiency outcomes in urban roads

2.4 Theoretical Framework

2.4.1 Application of Project Management Theories

In this study, the theoretical framework is built upon well-established project management theories, such as the Project Management Body of Knowledge (PMBOK) and Lean Construction Theory. These theories provide a structured foundation for examining essential aspects of project management, including planning, risk management, and stakeholder engagement.

PMBOK as a Guide for Planning and Risk Management

The PMBOK framework, developed by the Project Management Institute (PMI), is one of the most widely recognized guides for managing projects effectively. It offers a comprehensive set of knowledge areas and processes that help streamline project management tasks (PMI, 2021). When applied to road construction projects, PMBOK emphasizes the importance of thorough planning, which includes defining the project scope, setting realistic schedules, and allocating resources efficiently. These principles are directly relevant to this study, as effective planning is often the foundation of successful road construction projects.

In addition to planning, PMBOK outlines best practices for managing project risks. The framework encourages identifying potential risks early in the project lifecycle, assessing their impact, and developing mitigation strategies (PMI, 2021). This structured approach is critical in the Ethiopian context, where road construction projects often face challenges such as funding shortages, unforeseen site conditions, and delays caused by weather or regulatory issues. For example, Berhanu and Tadesse (2020) noted that Ethiopian road projects frequently encounter cost overruns due to poor risk management, highlighting the relevance of PMBOK's guidance in addressing these issues.

Lean Construction Theory and Its Focus on Efficiency

Lean Construction Theory, derived from Lean Manufacturing principles, focuses on maximizing value while minimizing waste in construction projects (Koskela et al., 2019). This theory emphasizes collaboration among stakeholders, continuous improvement, and the elimination of inefficiencies, making it particularly applicable to road construction projects. In the Ethiopian

context, Lean Construction Theory offers valuable insights for reducing material wastage, improving workflow, and ensuring that resources are used optimally.

One of the key principles of Lean Construction is "just-in-time" delivery, which aims to reduce inventory costs and prevent delays caused by resource shortages. According to Desta and Alemayehu (2021), many Ethiopian road projects suffer from inefficiencies related to poor material handling and inadequate supply chain management. By incorporating Lean Construction practices, these projects could achieve better outcomes in terms of cost and time efficiency. This theory also highlights the importance of engaging all stakeholders, including contractors, designers, and clients, to ensure that project goals align with stakeholders' expectations and priorities.

Integration of Theories for Stakeholder Engagement

Both PMBOK and Lean Construction Theory emphasize the critical role of stakeholder engagement in project success. PMBOK identifies stakeholder management as one of its key knowledge areas, outlining processes for identifying stakeholders, analyzing their needs, and maintaining open lines of communication throughout the project (PMI, 2021). Similarly, Lean Construction Theory advocates for collaborative decision-making and active involvement of all parties to ensure that the project delivers value to its stakeholders (Koskela et al., 2019).

In the context of road construction projects in Ethiopia, stakeholder engagement is often complicated by diverse and sometimes conflicting interests. For example, community members may prioritize minimizing disruptions during construction, while contractors may focus on meeting deadlines and budgets. Integrating principles from PMBOK and Lean Construction Theory can help balance these interests by fostering transparency and collaboration. This study aims to explore how these theoretical approaches can improve stakeholder engagement, leading to more efficient and successful road projects.

Practical Implications of the Theoretical Framework

By combining PMBOK and Lean Construction Theory, this study establishes a comprehensive framework for examining planning, risk management, and stakeholder engagement. The integration of these theories allows for a holistic analysis of road construction projects, considering both the structured processes outlined in PMBOK and the efficiency-focused principles of Lean

Construction. This dual approach is particularly relevant for Ethiopian road projects, where challenges such as resource constraints and stakeholder conflicts often undermine project efficiency.

Moreover, this theoretical framework provides a basis for recommending practical solutions. For instance, applying PMBOK's risk management processes can help mitigate common issues like budget overruns and scheduling delays, while Lean Construction principles can enhance resource utilization and minimize waste. By addressing these aspects, this study contributes to the broader goal of improving the efficiency and effectiveness of road construction projects in Ethiopia.

Table 2.2: Summary of Theoretical Frameworks and Their Applications to Road Construction Projects

Theory	Key Concepts	Application to Study	Reference
Triple Constraint Theory	Balances the three project constraints: time, cost, and quality.	Guides the assessment of road project efficiency by evaluating performance on time, budget, and quality.	Tesfaye, A., & Mekonnen, D. (2020). Challenges and solutions in Ethiopian road construction projects. *Journal of Infrastructure Development in Africa*, 10(4), 78–92.
Systems Theory	Views projects as interrelated components that must work together for success.	Explains the interactions between independent variables (e.g., planning, stakeholder engagement) and their collective impact on efficiency.	Desta, K., & Alemayehu, B. (2021). Risk management in Ethiopian road construction projects. *Ethiopian Journal of Civil Engineering*, 8(2), 45–59.
Logical Framework Approach (Logframe)	A planning and management tool that links inputs,	Supports structured project planning, monitoring, and evaluation.	Abebe, G., & Bekele, H. (2019). The role of stakeholder engagement in road construction projects:

	outputs, outcomes, and impacts.		Insights from Ethiopia. *African Journal of Project Management*, 6(1), 34–45.
Theory of Change (ToC)	Focuses on identifying desired outcomes and mapping backward to determine the necessary interventions.	Helps link project management practices to long-term road project efficiency.	Desta, H., & Tadesse, A. (2022). Monitoring and evaluation practices in Ethiopian infrastructure projects. *International Journal of Project Monitoring Studies*, 5(3), 56–70.
PMBOK (Project Management Body of Knowledge)	Provides standardized guidelines for project management, covering planning, execution, and monitoring.	Acts as a framework for implementing project management practices like planning, risk management, and M&E.	Project Management Institute (PMI). (2017). *A guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*. Newtown Square, PA: PMI.
Lean Construction Theory	Focuses on minimizing waste and maximizing value in construction projects.	Improves resource allocation and cost management in road construction.	Koskela, L. (2020). Theory of Lean Construction: Origins and Transformations. *Construction Economics and Building*, 20(2), 1–8.

2.4.2 Framework for Assessing Road Project Efficiency

This section explains the theoretical framework connecting the independent variables (various project management practices) to the dependent variable (road project efficiency). The aim is to provide a clear understanding of how specific management practices influence project outcomes in terms of time, cost, and quality.

Dependent Variable: Road Project Efficiency

Road project efficiency is the ability of a project to achieve its goals within the allocated time, budget, and quality standards. For example, if a road project is completed on schedule, stays within its planned budget, and meets the required technical specifications, it can be considered efficient. These three dimensions—time, cost, and quality—are commonly used to assess project success (Project Management Institute [PMI], 2021).

Timely completion ensures that projects avoid unnecessary delays. Staying within budget is crucial for financial sustainability, especially in resource-constrained environments like Ethiopia. Meeting quality standards ensures that roads are safe and durable, preventing future maintenance costs and accidents.

Independent Variables: Project Management Practices

The framework identifies seven key project management practices as independent variables:

1. **Planning Practices**

   Planning involves defining the project's scope, objectives, and work breakdown structure. It includes setting milestones, resource allocation, and scheduling. Effective planning helps prevent delays and budget overruns. According to Tesfaye and Mekonnen (2020), poor planning is one of the main reasons for inefficiencies in Ethiopian road projects. By outlining clear goals and allocating resources early, planning directly supports timely completion and cost control.

2. **Risk Management Practices**

   Risk management focuses on identifying and mitigating potential risks that could affect the project. This involves creating contingency plans and monitoring risks regularly. Desta and Alemayehu (2021) found that proactive risk management reduces delays and ensures that projects stay on budget. For example, identifying risks like unexpected weather conditions or material shortages allows project managers to take preventive actions, ensuring the project remains on track.

3. **Resource Allocation Practices**

Resource allocation is about managing labor, materials, and equipment efficiently. This practice ensures that resources are available when needed and used optimally to prevent waste. Abebe and Bekele (2019) observed that resource mismanagement often leads to delays and cost overruns in Ethiopian road projects. Proper allocation contributes to cost savings and ensures the quality of work.

4. **Monitoring and Evaluation (M&E) Practices**

Monitoring and evaluation involve tracking progress and assessing performance against predefined goals. Regular reporting and feedback loops help identify issues early and allow corrective actions to be taken (PMI, 2021). By keeping the project aligned with its objectives, M&E practices ensure timely completion and adherence to quality standards.

5. **Cost Management Practices**

Cost management includes planning, estimating, and controlling project expenditures. It helps prevent budget overruns by ensuring that spending aligns with the approved budget. Studies by Tesfaye and Mekonnen (2020) highlight the importance of detailed budget preparation and expenditure tracking in Ethiopian road projects. Cost management practices directly improve financial efficiency without compromising quality.

6. **Communication Practices**

Effective communication ensures that all stakeholders are informed and aligned throughout the project. This involves regular meetings, progress updates, and the use of digital communication tools. Clear communication reduces misunderstandings and improves decision-making (Desta & Tadesse, 2022). Improved communication can lead to smoother workflows, ensuring projects are completed on time and meet quality expectations.

7. **Stakeholder Engagement Practices**

Stakeholder engagement involves consulting and collaborating with individuals or groups who have an interest in the project. This ensures that their concerns are addressed, reducing resistance and delays. Abebe and Bekele (2019) noted that effective stakeholder

engagement leads to faster project approvals and higher satisfaction levels. This practice also ensures that the project meets community needs, contributing to quality outcomes.

Theoretical Connections

The framework builds on established theories like the PMBOK Guide and Lean Construction Theory to connect these independent variables to road project efficiency.

- **PMBOK Guide:**

  The PMBOK framework emphasizes the integration of project management knowledge areas to achieve desired outcomes (PMI, 2021). For instance, planning practices set the stage for risk management, resource allocation, and M&E, creating a seamless workflow that enhances efficiency.

- **Lean Construction Theory:**

  Lean Construction focuses on reducing waste and maximizing value in project workflows. It aligns with practices like resource allocation and M&E by promoting efficiency and quality (Koskela et al., 2019). For example, eliminating wasteful processes and continuously improving workflows contribute to better time, cost, and quality outcomes.

Framework Application

The framework assumes that each independent variable influences one or more dimensions of road project efficiency:

- **Timely Completion:** Influenced by planning (clear schedules), risk management (proactive mitigation), and communication (streamlined coordination).
- **Budget Adherence:** Supported by cost management (budget tracking) and resource allocation (efficient usage).
- **Quality Standards:** Enhanced through stakeholder engagement (aligning with user needs) and M&E (ensuring standards are met).

For example, a project with well-defined plans, proactive risk management, and effective communication is more likely to be completed on time and within budget, while meeting quality standards.

2.5 Conceptual Framework

The conceptual framework provides a structured representation of how various independent variables—key project management practices—relate to the dependent variable, road project efficiency. This framework guides the analysis by outlining specific linkages between these variables, providing a basis for understanding the dynamics of project success.

2.5.1 Relationships Between Variables

The conceptual framework is centered on the idea that project management practices such as planning, risk management, resource allocation, monitoring and evaluation (M&E), cost management, and stakeholder engagement all contribute to the efficiency of road projects. Efficiency is measured by three key dimensions: timely project completion, adherence to budgets, and meeting quality standards.

1. Planning Practices and Road Project Efficiency

Planning serves as the foundation for project success by defining the project scope, objectives, and deliverables. It involves setting clear milestones, assigning resources, and scheduling activities to prevent delays. Proper planning ensures that the project stays on track and avoids unnecessary time and cost overruns.

For example, Tesfaye and Mekonnen (2020) argued that in Ethiopian road projects, detailed planning significantly reduces risks of delays and improves adherence to budgets. By aligning schedules and resources, planning creates a roadmap that enhances both cost control and quality outcomes. Therefore, a well-prepared project plan directly contributes to timely completion, budget adherence, and quality standards.

2. Risk Management Practices and Road Project Efficiency

Risk management involves identifying, assessing, and mitigating potential risks throughout the project lifecycle. By addressing uncertainties proactively, risk management minimizes disruptions that could affect project timelines, costs, or quality.

Desta and Alemayehu (2021) observed that Ethiopian road projects often face risks like material shortages and adverse weather conditions. Effective risk management, such as developing contingency plans and monitoring potential risks, helps ensure that projects remain on schedule

and within budget. This process also enhances the quality of deliverables by reducing the likelihood of errors or rework caused by unforeseen challenges.

3. Resource Allocation Practices and Road Project Efficiency

Efficient resource allocation ensures the optimal use of labor, materials, and equipment. Properly allocated resources help prevent project delays caused by shortages or overuse, contributing to cost savings and quality improvement.

According to Abebe and Bekele (2019), mismanagement of resources is a common challenge in Ethiopian road construction, leading to inefficiencies and additional costs. They found that systematic allocation and monitoring of resources enhance the project's ability to meet deadlines and maintain high-quality standards. For instance, ensuring the availability of machinery during critical phases of construction can prevent interruptions and ensure smooth progress.

4. Monitoring and Evaluation Practices and Road Project Efficiency

Monitoring and evaluation (M&E) involve continuous tracking of project progress and performance against predefined objectives. This ensures that any deviations from the plan are identified and corrected in real-time, improving both time and cost efficiency.

As noted by Desta and Tadesse (2022), M&E practices like progress reporting and feedback mechanisms are essential for Ethiopian infrastructure projects. These tools allow project managers to adjust schedules or reallocate resources as needed, ensuring that quality standards are maintained while adhering to the timeline and budget.

5. Cost Management Practices and Road Project Efficiency

Cost management focuses on planning, estimating, and controlling project expenditures. It ensures that spending aligns with the approved budget while maintaining quality.

Tesfaye and Mekonnen (2020) emphasized that cost management is critical for financial efficiency in Ethiopian road projects, where resource constraints are often significant. Practices such as budget preparation, cost forecasting, and expenditure tracking help prevent overspending and ensure financial sustainability. By reducing waste and controlling costs, these practices directly contribute to the overall efficiency of road projects.

6. Communication Practices

Communication practices play a critical role in ensuring project success by aligning stakeholders, clarifying expectations, and addressing potential challenges effectively. Clear and consistent communication fosters trust and transparency, which are essential in collaborative environments. Turner (2020) highlighted that regular communication practices help prevent misunderstandings and streamline project processes, particularly in complex settings like road construction projects. These projects often involve multiple stakeholders, including contractors, engineers, and local authorities, making effective communication a cornerstone for achieving project objectives.

In addition, communication significantly influences stakeholder engagement. Smith and Brown (2019) noted that open communication channels allow teams to identify risks early and make necessary adjustments, reducing the likelihood of delays and conflicts. Regular updates, meetings, and feedback sessions also ensure that stakeholders feel valued and heard, which enhances their commitment to the project's success. In Ethiopia, where road projects frequently face challenges such as resource constraints and competing stakeholder interests, Johnson et al. (2018) emphasized the importance of active listening and collaboration. Incorporating robust communication practices, as Walker and Hall (2021) suggested, contributes to better planning, smoother execution, and more efficient project outcomes.

7. Stakeholder Engagement Practices and Road Project Efficiency

Stakeholder engagement involves identifying key stakeholders, understanding their needs, and managing their involvement throughout the project lifecycle. Engaged stakeholders are more likely to support the project, reducing delays caused by conflicts or misunderstandings.

Abebe and Bekele (2019) found that effective stakeholder engagement in Ethiopian road projects led to faster approvals, fewer disputes, and better alignment with community needs. This practice not only enhances project timelines but also ensures that the final deliverables meet quality standards, thereby increasing overall efficiency.

Conceptual Framework

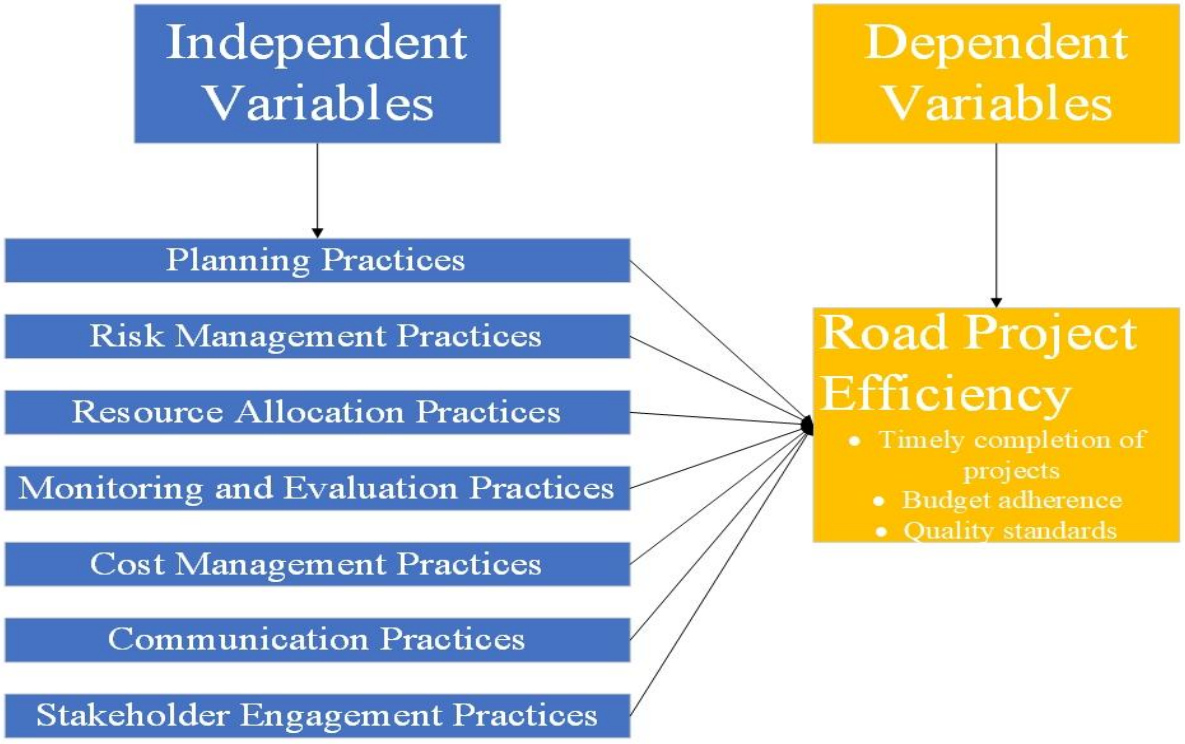

Figure 2.1: Conceptual Framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

This study was conducted in Addis Ababa, the capital city of Ethiopia, located in the central highlands at an altitude of approximately 2,355 meters above sea level. As the country's political, economic, and infrastructural center, Addis Ababa plays a pivotal role in Ethiopia's urban development agenda. The city is currently undergoing significant transformation, marked by rapid population growth, urban expansion, and an increasing demand for efficient infrastructure, particularly in road construction.

The Addis Ababa City Road Authority (AACRA), the subject of this study, is responsible for the planning, implementation, and maintenance of urban road projects within the city. Given the authority's central role in shaping the capital's transportation network, it serves as an ideal case for investigating how project management practices influence road project performance outcomes such as timely completion, budget adherence, and quality standards.

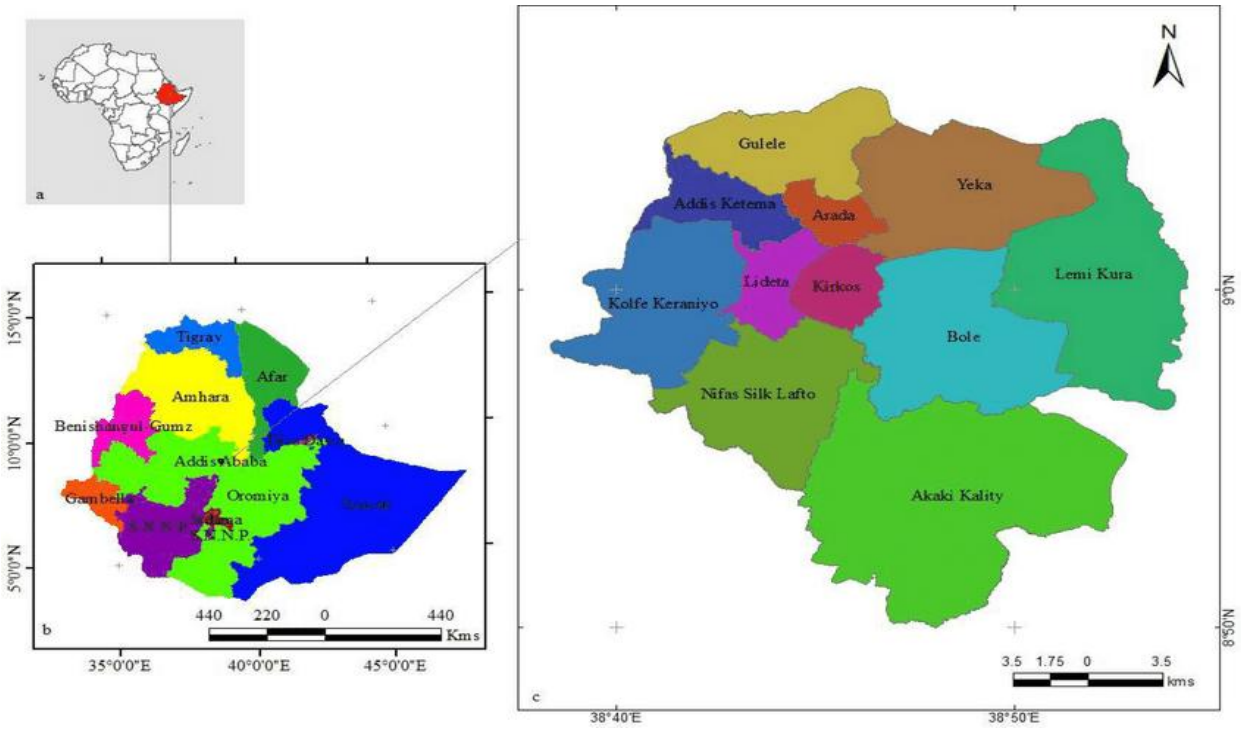

Figure 3.1: Illustrates the location of Addis Ababa within Ethiopia

3.2 Research Design

This study employed a quantitative explanatory research design to assess the impact of various project management practices on road project efficiency. The design was selected because it allows for the identification and measurement of cause-effect relationships between independent variables (project management practices) and dependent variables (road project performance outcomes).

The research process followed a structured and deductive approach. Primary data were collected using a structured questionnaire distributed to selected professionals at the Addis Ababa City Road Authority, including engineers, project managers, supervisors, and technical staff involved in road construction projects. The questionnaire was designed based on constructs derived from existing literature, covering key project management dimensions such as planning, cost management, resource allocation, monitoring and evaluation, risk management, stakeholder engagement, and communication.

Descriptive statistics (such as mean, standard deviation, and frequency) were used to summarize respondent characteristics and responses. Inferential statistical techniques, including Pearson correlation and multiple linear regression analysis, were applied to examine the strength and direction of relationships between the project management practices and project performance indicators.

The explanatory design was particularly suited for this study as it facilitated hypothesis testing and helped to quantify the influence of each management practice on road project outcomes. This allowed the research to move beyond surface-level descriptions and provide actionable insights and evidence-based recommendations to improve project execution efficiency within AACRA.

To ensure methodological rigor, the study followed a six-phase research sequence. Each phase contributed to the systematic execution and analysis of the study, as outlined in Table 3.1 below:

Table 3.1: Summary of Research Sequence

Phase	Description	Purpose
Phase 1: Literature Review	Analyzed existing national and international research on project management practices and road construction efficiency.	To develop the conceptual framework and identify key variables for the study.
Phase 2: Instrument Design	Developed a structured questionnaire based on the theoretical constructs. Conducted pre-testing for refinement.	To create valid and reliable tools for data collection.
Phase 3: Sampling and Data Collection	Disturbute questionnaire for AACRA staff. Distributed 210 questionnaires and collected 200 valid responses.	To ensure representative and sufficient data for analysis.
Phase 4: Data Preparation and Coding	Entered and cleaned data using SPSS. Checked for completeness, consistency, and outliers.	To prepare a robust dataset for analysis.
Phase 5: Data Analysis	Conducted descriptive statistics, correlation analysis, and multiple regression modeling.	To identify and measure the relationships between project management practices and performance outcomes.
Phase 6: Interpretation and Synthesis	Interpreted results in light of literature and research objectives. Derived practical conclusions and recommendations.	To provide evidence-based insights and inform decision-making.

This systematic and phased methodology ensured that the research findings were reliable, valid, and contextually relevant to the realities of road project management in Addis Ababa.

3.3 Research Approach

This study employed a quantitative research approach to assess the impact of project management practices on road project efficiency within the Addis Ababa Road Authority (AACRA). The quantitative approach was selected because it allows for the collection and analysis of numerical data, enabling the researcher to examine relationships between variables and draw generalizable conclusions based on statistical evidence.

Structured questionnaires were used as the primary data collection instrument, targeting a sample of AACRA employees involved in project planning, execution, and evaluation. This approach facilitated the measurement of respondents' perceptions and experiences regarding seven key project management practices planning, risk management, resource allocation, monitoring and evaluation, cost management, communication, and stakeholder engagement and their influence on three critical efficiency outcomes: timely completion, budget adherence, and quality standards.

3.4 Sampling

3.4.1 Target Population

The target population for this study included professionals involved in road construction projects in Addis Ababa. These individuals represent key roles in the planning, execution, and supervision of road infrastructure initiatives. The population breakdown is as follows:

Table 3.2: Target Population Distribution by Occupation

Occupation	**Population**
Client	155
Contractor	136
Consultant	107
Total	**398**

Source: (From Addis Ababa City Road Authority Human Resource Departement)

These categories encompass client representatives (e.g., AACRA staff), contractors, consultants, and other stakeholders involved in the lifecycle of road projects in Addis Ababa.

3.4.2 Sampling Technique

In this study, purposive sampling was employed to select participants who possess relevant knowledge and direct involvement in project management processes within AACRA. This non-probability sampling technique was appropriate given the need to gather information from individuals most capable of providing insight into planning, monitoring, resource allocation, budgeting, and execution practices. The participants were selected based on their roles,

professional experience, and participation in the implementation of road construction projects under AACRA.

3.4.3 Sample Size

Determining the appropriate sample size is essential to ensure that the results of a study are reliable and applicable to the broader population. If the sample is too small, the findings may not reflect the views of the larger group. On the other hand, using a sample that is too large may waste time and resources (Sekaran & Bougie, 2016).

This study focused on employees of the Addis Ababa Road Authority (AACRA) who are directly involved in project planning, execution, and evaluation. According to the AACRA's Human Resource Directorate (2024), the total number of such employees was approximately 400. To determine an appropriate sample size for the quantitative survey, Yamane's (1967) formula was used at a 95% confidence level and 5% margin of error:

The formula is: $n = \frac{N}{1 + \mathrm{N}(\mathrm{e})^2}$

Where:

- n = sample size
- N = population size (400)
- e = margin of error (0.05)

$$n = \frac{398}{1+398(0.05)^2} = n = \frac{398}{1+398(0.0025)} = n = \frac{398}{1+0.995} = n = \frac{398}{1.995} = 199.5$$

Based on this calculation, the sample size for the study was ≈ 200 respondents. This number provided a balance between accuracy and feasibility, aligning with the 95% confidence level commonly used in social science research (Creswell & Creswell, 2018).

To ensure representation from all categories, the sample size was proportionally distributed based on the relative size of each occupation group. The following table shows the sample size distribution:

Table 3.3: Sample Size Distribution by Occupation

Occupation	Population	Proportional Share (%)	Sample Size (n ≈ 200)
Client	155	38.94%	78
Contractor	136	34.17%	68
Consultant	107	26.89%	54
Total	**398**	**100%**	**200**

This stratified allocation ensures that the perspectives of all critical roles in road project implementation are adequately captured in the study.

3.5 Data Collection

3.5.1 Data Sources

The study relied on primary to ensure a comprehensive understanding of the research problem.

- Primary Data: Structured questionnaires were distributed to professionals involved in road projects to gather quantitative data.

3.5.2 Data Collection Procedure

The data collection process followed these steps:

1. Distribution of Questionnaires: Questionnaires were distributed through both email and in-person visits to construction project sites in Addis Ababa.
2. Follow-up: Regular follow-ups were conducted to maximize the response rate.

3.5.3 Field Controls

To maintain consistency and reliability during data collection, the following measures were implemented:

- Clear instructions were provided to all respondents to ensure uniformity in responses.
- The researcher personally supervised the data collection process to address any questions or concerns.
- Completed questionnaires were carefully reviewed and securely stored to prevent data loss.

3.5.4 Timeline

The data collection process was carried out over a three-month period:

- Month 1: Pre-testing and distribution of questionnaires.
- Month 2: Data collection and follow-up.
- Month 3: Data entry and preliminary analysis.

3.6 Data Analysis

The data collected was analyzed using Statistical Package for the Social Sciences (SPSS) software. The following analytical methods were employed:

- Descriptive Statistics: Measures such as mean, standard deviation, and frequency distribution were used to summarize the data.
- Inferential Statistics:
    - Correlation Analysis: Examined the relationships between independent variables and the dependent variable.
    - Multiple Regression Analysis: Determined the strength and direction of the influence of independent variables on road project efficiency.

3.8 Validity and Reliability of the Instrument

To ensure the quality of the research tool, the questionnaire was assessed for both validity and reliability. Validity refers to the extent to which the instrument measures what it is intended to measure, while reliability refers to the consistency of the instrument across different applications (Creswell & Creswell, 2018).

3.8.1 Instrument Validity

The questionnaire was adapted from established project management literature and reviewed by academic experts in project management and research methods. This expert review process ensured that each item was appropriate, clear, and aligned with the study objectives. Content validity was confirmed through the agreement of reviewers regarding the relevance of each item to the variables under investigation. This type of validation is often used in studies where structured

instruments are designed for organizational and behavioral assessment (Bell, Bryman, & Harley, 2019).

3.8.2 Instrument Reliability

Reliability was tested using Cronbach's Alpha for each variable, which measures internal consistency. According to Nunnally and Bernstein (as cited in Hair et al., 2019), a Cronbach's Alpha value of 0.70 or above is considered acceptable for research. Table 3.1 shows the Cronbach's Alpha values for all variables in this study, all of which exceed the minimum threshold, indicating good internal reliability.

Table 3.4: Cronbach's Alpha for Each Variable

Variable	Number of Items	Cronbach's Alpha
Planning Practices (PP)	5	0.781
Risk Management Practices (RMP)	5	0.775
Resource Allocation (RAP)	5	0.798
Monitoring and Evaluation (MEP)	5	0.836
Cost Management (CMP)	5	0.859
Communication Practices (CP)	5	0.829
Stakeholder Engagement (SEP)	5	0.795
Timely Completion (TC)	5	0.864
Budget Adherence (BA)	5	0.838
Quality Standards (QS)	5	0.833

Source: (Own Survey 2025)

All variables had Cronbach's Alpha values above 0.77, demonstrating that the items used to measure each construct are reliably grouped. These results confirm that the questionnaire is consistent and suitable for use in further statistical analysis (Sekaran & Bougie, 2016).

3.9 Ethical Consideration

This study was conducted in strict accordance with established ethical guidelines and professional research standards to ensure the rights, dignity, safety, and well-being of all participants were protected. Ethical integrity was upheld throughout the research process, from the planning stage through to data analysis and dissemination of findings.

In line with ethical research practices, the following key principles were implemented:

1. Informed Consent

   Prior to participation, each respondent was provided with comprehensive information about the purpose, scope, and methodology of the study. This included the study's objectives, the type of data to be collected, the voluntary nature of participation, and the participants' right to withdraw at any time without penalty. Consent forms were distributed and signed after participants affirmed their understanding of the information provided. This approach ensured that participation was fully informed and voluntary (Bryman, 2016).

2. Confidentiality and Anonymity

   To safeguard the privacy of participants, all responses were kept strictly confidential. Identifying information was not recorded or disclosed. The data were anonymized and stored securely in password-protected digital files accessible only to the researcher. Any presentation of findings in the report was done in aggregate form, avoiding any risk of individual identification.

3. Beneficence

   The principle of beneficence guided the research to ensure that it would bring tangible benefits without exposing participants to harm. The findings are intended to enhance the understanding and application of project management practices in road construction projects, thereby contributing to the improvement of infrastructure delivery, operational efficiency, and public service outcomes. Participants were not exposed to physical, psychological, or social risks.

4. Justice

   The selection of study participants was conducted fairly and without bias. Participants were chosen based on their professional relevance to the research topic, ensuring that inclusion

criteria were applied equitably. Equal opportunity for participation was provided, and no individual or group was unfairly excluded or burdened by the research.

5. Respect for Persons

   Participants were treated with respect throughout the research process. Their autonomy and decision-making authority were upheld, and they were given ample time to decide on their participation. No coercion or undue influence was exercised.

6. Ethical Clearance

   Prior to data collection, ethical clearance was obtained from the Institutional Review Board (IRB) of Adama Science and Technology University. The proposal was reviewed to ensure compliance with both national and international ethical research standards, including those outlined in the Belmont Report (1979) and the Declaration of Helsinki (World Medical Association, 2013). The IRB approval served as a safeguard to affirm that all ethical considerations were adequately addressed.

This study demonstrated a strong commitment to research ethics, emphasizing respect, transparency, and the responsible conduct of research. These measures ensured that the study maintained academic integrity while also protecting the rights and welfare of all participants.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results of the study and discusses the findings based on the data collected from employees of the Addis Ababa Road Authority. The aim of the study was to assess how different project management practices affect the efficiency of road construction projects. This includes evaluating the impact of planning, risk management, resource allocation, monitoring and evaluation, cost management, communication, and stakeholder engagement on the timely completion, cost control, and quality of road projects.

To analyze the data, descriptive statistics were used to summarize the responses. Reliability tests were carried out to check the consistency of the responses. Correlation and regression analyses were then applied to examine the relationships between project management practices and project efficiency indicators. These methods helped identify which practices had the strongest influence on efficiency.

Out of the 210 questionnaires distributed, 200 were completed and returned, resulting in a response rate of 95.2%. This high response rate ensures that the findings are based on a broad and reliable dataset.

4.2 Demographic Profile of Respondents

This section provides a summary of the background information of the respondents who participated in the study. The demographic variables analyzed include gender, age, role in the project, years of experience in road construction, and the number of road projects they have been involved in over the past five years. These variables help to contextualize the findings by highlighting the characteristics and diversity of the professionals working under the Addis Ababa Road Authority.

4.2.1 Role in the Project

This section presents the distribution of respondents according to their roles in road construction projects managed by the Addis Ababa City Road Authority (AACRA).

Table 4.1: Role in the Project

Role in the Project	Frequency	Percentage (%)
Client	78	39.0%
Contractor	68	34%
Consultant	54	27%
Total	**200**	**100%**

Source: (Own Survey 2025)

The analysis of respondent roles reveals a well-balanced representation of key stakeholders involved in road construction projects under the Addis Ababa City Road Authority. Site Engineers made up the largest group (38.5%), highlighting the study's strong technical foundation, as these professionals are central to daily project execution and quality control. Contractors (14.5%) and team leaders (13.0%) provided practical insights into on-site coordination, resource use, and schedule adherence, while supervisors (11.0%) contributed perspectives on monitoring and compliance. Contract administrators and consultants (each 8.5%) offered viewpoints on procurement, oversight, and policy implementation, and project managers (6.0%) brought a strategic perspective on organizational planning and interdepartmental coordination. This distribution ensures that the findings reflect a comprehensive view of project management practices across all operational and managerial levels, thereby enhancing the depth and credibility of the study's conclusions on road project efficiency.

4.2.2 Years of Experience in Road Construction Projects

Work experience helps indicate how familiar respondents are with the realities of project execution. Those with more experience may offer deeper insights into project efficiency and long-term trends.

Table 4.2: Years of Experience in Road Construction Projects

Experience Range	Frequency	Percent (%)
1 to 3 years	46	23.0%
4 to 6 years	38	19.0%
7 to 10 years	52	26.0%
More than 10 years	64	32.0%
Total	**200**	**100%**

Source: (Own Survey 2025)

As shown in Table 4.4, the largest group of respondents—64 individuals (32%)—had more than 10 years of experience in road construction projects. This indicates a strong presence of highly experienced professionals in the sample, which adds depth and credibility to the data collected. The next largest group had 7 to 10 years of experience, comprising 52 respondents (26%), followed by 46 respondents (23%) with 1 to 3 years of experience. The group with 4 to 6 years of experience included 38 respondents (19%). This distribution shows that over 58% of respondents had more than 7 years of experience in the sector, ensuring that the majority of feedback comes from seasoned professionals with significant field exposure. Such a composition strengthens the validity of the findings, as it reflects informed views across various stages of road project planning and implementation.

4.2.3 Number of Road Projects Involved in the Last 5 Years

These variable measures the level of practical engagement of respondents in recent projects, which reflects their familiarity with project processes and management issues.

Table 4.3: Number of Road Projects Involved in the Last 5 Years

Projects Involved	Frequency	Percent
1 to 3 projects	49	24.5%
4 to 6 projects	46	23.0%
7 to 10 projects	54	27.0%
More than 10 projects	51	25.5%
Total	200	100.0%

Source: (Own Survey 2025)

Nearly all respondents had experience working on multiple road construction projects in the past five years. The largest group (27.0%) had been involved in 7 to 10 projects, followed closely by those who participated in more than 10 (25.5%). This shows that over half of the sample (52.5%) had engagement in more than 6 projects, suggesting a high level of project exposure. These individuals are likely to have seen various challenges and solutions, which could influence their understanding of what contributes to project efficiency.

4.3 Descriptive Statistics

This section presents descriptive results for the independent and dependent variables in the study. Each variable is measured using five items on a five-point Likert scale. The analysis focuses on both individual item responses and the overall tendencies of each variable by reporting the mean and standard deviation.

4.3.1 Independent Variables (IVs)

4.3.1.1 Planning Practices

Planning is a key function in project management and includes defining the project scope, setting timelines, and using structured tools. This variable assesses how planning is applied in road projects managed by the Addis Ababa Road Authority.

Table 4.4: Descriptive Statistics for Planning Practices

Item	Mean	Std. Deviation
PP1. Project plans are detailed and comprehensive	3.31	0.72
PP2. Planning tools like Gantt charts and WBS are effectively used	3.90	0.68
PP3. The project scope is clearly defined and communicated	3.71	0.72
PP4. Project plans are regularly reviewed and updated	3.64	0.75
PP5. Planning practices contribute to timely project completion	3.72	0.73
Average	**3.66**	**0.72**

Source: (Own Survey 2025)

The results indicated that the average mean for planning practices was 3.66, suggesting a generally positive perception from respondents. On a five-point Likert scale, this score falls between "Neutral" (3.0) and "Agree" (4.0), reflecting that planning activities were perceived to be satisfactorily applied but still had room for improvement. The highest-rated item was the use of

planning tools (Mean = 3.90), which showed that structured tools such as Gantt charts and Work Breakdown Structures were widely adopted and appreciated for enhancing coordination and project visibility. This was supported by a relatively low standard deviation of 0.68, suggesting consistency in respondent perceptions.

The lowest-rated item was PP1 (Mean = 3.31), indicating that although planning tools were used, not all respondents believed that the plans were comprehensive or detailed. This could signal issues in the quality or depth of the plans themselves, despite the presence of tools.

These findings aligned with the study by Teshome and Zeleke (2018), who reported that the use of formal planning tools increased project coordination and predictability in Ethiopian road projects. Similarly, Gebremedhin (2020) found that higher mean scores in planning practices (Mean = 3.84) were associated with improved performance outcomes in government infrastructure projects. However, compared to Gebremedhin's results, the slightly lower average mean in this study (3.66) suggested that planning practices within AACRA may be moderately strong but less robust than in some other agencies or contexts.

Furthermore, a study by Abebe and Bekele (2019) reported a planning mean of 3.45 in municipal projects, which was slightly lower than the current study's score, suggesting gradual improvements in planning performance over time within Addis Ababa's road sector.

While planning practices were generally well-implemented in AACRA projects—especially in terms of using planning tools—issues such as plan comprehensiveness and regular updating required further emphasis to enhance planning effectiveness.

4.3.1.2 Risk Management Practices

Risk management helps identify, assess, and respond to potential events that could negatively affect project outcomes. This section assesses how well risk-related practices are incorporated into road projects, including early identification, planning, stakeholder involvement, and the role of risk management in improving timeliness.

Table 4.5: Descriptive Statistics for Risk Management Practices

Item	Mean	Std. Deviation
RMP1. Risks are identified early in the project lifecycle	2.72	0.80
RMP2. Contingency plans are in place for identified risks	3.20	0.83
RMP3. Risk assessments are conducted regularly	2.85	0.79
RMP4. Stakeholders are involved in the risk management process	3.23	0.87
RMP5. Risk management improves timely project completion	3.14	0.86
Average	**3.03**	**0.83**

Source: (Own Survey 2025)

The overall mean score for risk management practices was 3.03, which was slightly above the neutral midpoint on a five-point Likert scale. This indicated a moderately favorable perception of risk management efforts across AACRA-managed projects. However, the relatively low scores for certain items revealed that risk practices were not fully institutionalized or consistently applied.

The lowest mean was recorded for RMP1 (Mean = 2.72), suggesting that many respondents believed risks were not identified early in the project lifecycle. Similarly, RMP3 (Mean = 2.85) showed that regular risk assessments were not uniformly conducted. These findings point to a shortfall in proactive and preventive risk procedures.

Conversely, stakeholder involvement in risk management (RMP4: Mean = 3.23) and contingency planning (RMP2: Mean = 3.20) received slightly higher scores, indicating that some projects included collaborative risk planning. Nonetheless, standard deviations for these items remained relatively high (0.83–0.87), reflecting variation in how such practices were implemented across projects.

These results were consistent with the findings of Desta and Alemayehu (2021), who reported that risk management practices in Ethiopian infrastructure projects were unevenly adopted, with a mean score of 3.01. Their study similarly found that while contingency measures were in place for some projects, early risk identification was often overlooked. The current study's results also aligned with Alemu and Tesfaye (2017), who emphasized that the absence of routine risk monitoring contributed to unexpected disruptions and delays in urban road projects.

Compared to the slightly higher mean of 3.20 reported by Belay and Mebratu (2020) in federal road projects, the average in this study (3.03) reflected modest implementation, possibly due to differences in institutional capacity or resource constraints at the municipal level.

While respondents acknowledged the existence of risk management practices in AACRA projects, the relatively low scores for early identification and regular assessment highlighted critical gaps. Addressing these gaps through structured risk planning and monitoring systems could significantly enhance project resilience and timeliness.

4.3.1.3 Resource Allocation Practices

Resource allocation is central to project performance. It involves the effective use of labor, equipment, materials, and tools throughout the project lifecycle. This section assesses how efficiently resources are planned, managed, and adjusted across road projects.

Table 4.6: Descriptive Statistics for Resource Allocation Practices

Item	Mean	Std. Deviation
RAP1. Resources are allocated efficiently	3.56	0.96
RAP2. Resource plans are reviewed and adjusted regularly	3.18	0.90
RAP3. Software tools are used to manage resource allocation	3.41	0.89
RAP4. Resource availability is sufficient during critical phases	2.94	0.87
RAP5. Resource allocation supports timely project completion	3.63	0.76
Average	**3.34**	**0.88**

Source: (Own Survey 2025)

The results show that respondents generally believe resource allocation is handled reasonably well in most projects. The highest mean was for RAP5 (Mean = 3.63, SD = 0.76), indicating that many agree resource management contributes to timely project delivery. The relatively low standard deviation suggests a consistent view among participants.

Efficient allocation of resources (RAP1) was also rated positively (Mean = 3.56, SD = 0.96), although the higher standard deviation suggests greater variability in how respondents perceive this across projects. Some may experience smoother workflows than others depending on project scale or coordination.

Software-supported resource planning (RAP3) received a moderate rating (Mean = 3.41, SD = 0.89). While the score reflects general agreement, the standard deviation indicates differences in how widely or effectively such tools are applied in practice.

Item RAP2, regarding the regular review and adjustment of resource plans, had a lower mean of 3.18 and a standard deviation of 0.90. This shows that while some projects make adjustments based on evolving needs, others may not follow up as consistently.

The lowest-rated item was RAP4 (Mean = 2.94, SD = 0.87), indicating that resource availability during critical phases is a concern. This could imply shortages or delays in resource delivery when it matters most.

The average standard deviation across items is 0.88, which points to moderate variability in responses. While resource planning seems to be generally in place, certain aspects—especially availability during key stages—need closer attention to avoid bottlenecks and project delays.

4.3.1.4 Monitoring and Evaluation (M&E) Practices

Monitoring and evaluation help ensure that projects remain on track by providing regular feedback and performance measurement. This section examines whether progress is tracked, performance metrics are used, reports are reviewed, and external evaluations are involved.

Table 4.7: Descriptive Statistics for Monitoring and Evaluation Practices

Item	Mean	Std. Deviation
MEP1. Project progress is tracked against goals	2.86	0.82
MEP2. Performance metrics are used to assess performance	2.80	0.85
MEP3. Monitoring reports are generated and reviewed regularly	2.64	0.83
MEP4. External evaluators are involved in the process	2.90	0.82
MEP5. M&E practices improve timely completion of projects	2.99	0.89
Average	**2.84**	**0.84**

Source: (Own Survey 2025)

The average mean score for M&E practices was 2.84, which fell slightly below the neutral midpoint of the five-point Likert scale. This suggested that respondents had generally mixed or reserved views regarding the strength of M&E systems in AACRA-managed projects. The

standard deviation (0.84) reflected moderate variation, indicating that experiences with M&E differed across projects.

The highest mean was for MEP5 (Mean = 2.99), showing near-neutral agreement that M&E contributes to timely project completion. Similarly, the involvement of external evaluators (MEP4: Mean = 2.90) was moderately rated, though the score implied that such involvement was not systematic across all projects.

Tracking progress (MEP1) and using performance metrics (MEP2) received relatively low mean scores (2.86 and 2.80, respectively), suggesting a lack of rigorous, quantifiable performance monitoring in many cases. The lowest-rated item was MEP3 (Mean = 2.64), which indicated weak practices in generating and reviewing monitoring reports.

These findings were consistent with those of Getachew and Alemu (2019), who reported that many public infrastructure projects in Addis Ababa lacked formal M&E frameworks and operated without frequent progress reviews. Their study revealed an M&E practice mean of 2.76, closely mirroring the 2.84 average reported here.

Similarly, a study by Gebre and Habtamu (2020) noted that municipal construction projects often lacked third-party evaluations and failed to apply metrics consistently, which compromised oversight and early detection of implementation delays. Compared to federal-level projects studied by Worku and Kebede (2021), where the M&E mean was 3.30, the relatively lower mean in this study suggested less institutionalized M&E structures at the city administration level.

M&E practices in AACRA road projects appeared to be inadequately developed, with limited use of structured progress tracking tools, insufficient reporting routines, and inconsistent evaluator engagement. Strengthening M&E systems through capacity building and integration of digital tools could significantly improve performance tracking and corrective decision-making.

4.3.1.5 Cost Management Practices

Cost management involves planning, estimating, budgeting, and controlling project expenses. This section explores how well road construction projects manage their budgets, use cost-tracking tools, and respond to financial risks.

Table 4.8: Descriptive Statistics for Cost Management Practices

Item	Mean	Std. Deviation
CMP1. Project budgets are prepared in detail and regularly updated	3.25	0.64
CMP2. Cost forecasts are reviewed and adjusted regularly	3.21	0.62
CMP3. Cost management software is used to track expenditures	3.44	0.57
CMP4. Project expenditures are kept within the approved budget	2.90	0.58
CMP5. Cost management supports timely project completion	2.98	0.62
Average	**3.16**	**0.61**

Source: (Own Survey 2025)

The average mean value for cost management practices was 3.16, suggesting that respondents moderately agreed that cost management practices were in place across AACRA projects. Although this value is above the neutral point of 3.00, it did not reach the "Agree" threshold, indicating a modest perception of implementation quality. The relatively low average standard deviation (0.61) suggested that views on cost practices were fairly consistent among respondents.

The highest-rated item was CMP3 (Mean = 3.44), indicating that cost tracking tools, including digital software, were in relatively widespread use across projects. This finding reflected a positive trend in modernizing cost management systems. On the other hand, the lowest-rated item was CMP4 (Mean = 2.90), which suggested that projects frequently struggled to stay within budget, despite the availability of tracking tools.

Detailed budgeting (CMP1: Mean = 3.25) and forecast reviews (CMP2: Mean = 3.21) were moderately rated, implying that financial planning mechanisms were present but possibly lacked rigor or timely updates. The perception that cost management contributed to schedule adherence (CMP5: Mean = 2.98) remained nearly neutral, showing that respondents were unsure about its impact on timely delivery.

These findings were comparable to the study by Tesfaye and Mekonnen (2020), who reported a cost management mean score of 3.12 in urban transport infrastructure projects in Addis Ababa, with similar concerns about weak budget execution and adjustment mechanisms. Likewise, Kebede and Merga (2018) found that despite the use of financial control systems, cost overruns were common due to poor forecasting and inadequate procurement planning.

In contrast, federal-level studies such as that of Wondimu and Yilma (2021) reported a higher mean (3.56) in national highway projects, suggesting that cost management systems may be more robust at the national level due to better funding, staffing, and oversight.

While AACRA projects employed cost-tracking tools and financial planning techniques, the inability to consistently remain within budget highlighted shortcomings in execution. These issues suggested a need for more disciplined cost control, responsive forecasting, and enhanced integration between technical and financial planning functions.

4.3.1.6 Communication Practices

Effective communication ensures that all stakeholders are informed, coordinated, and able to respond promptly to project needs. This section assesses the use of communication tools, meetings, plan updates, and their contribution to project outcomes.

Table 4.9: Descriptive Statistics for Communication Practices

Item	Mean	Std. Deviation
CP1. Communication among stakeholders is effective	3.13	0.92
CP2. Regular meetings and progress updates are conducted	3.31	0.98
CP3. Digital tools support project coordination	3.05	0.91
CP4. Communication plans are reviewed and updated regularly	3.19	1.01
CP5. Communication helps timely completion of road projects	3.17	0.78
Average	**3.17**	**0.92**

Source: (Own Survey 2025)

The average mean for communication practices was 3.17, which falls just above the midpoint of the five-point Likert scale. This suggested that respondents had slightly positive perceptions of communication systems within road projects. However, the relatively high standard deviation (0.92) indicated significant variation in how communication was experienced across different project environments.

The highest-rated item was CP2 (Mean = 3.31), suggesting that regular meetings and updates were somewhat common, although the standard deviation of 0.98 revealed that this was not consistent across all project teams. CP5 (Mean = 3.17) indicated that communication was perceived as contributing to timely completion, albeit with slightly less agreement.

The lowest-rated item was CP3 (Mean = 3.05), indicating that the use of digital coordination tools such as emails, project management platforms, or instant messaging apps was moderate at best. CP4 (Mean = 3.19) reflected only a modest level of regular review and updating of communication plans, while CP1 (Mean = 3.13) pointed to a general sense of communication effectiveness, though with room for improvement in clarity and reach.

These findings were broadly aligned with the study by Tulu and Guta (2018), who reported a communication practices mean of 3.14 in road construction projects managed by local authorities in Oromia. They found that while physical meetings were fairly common, digital integration and formal communication structures were often missing. Similarly, Ayele and Demisse (2020) noted that communication inconsistencies across project hierarchies contributed to delays and coordination breakdowns.

By comparison, Habtamu and Mekuria (2021) found a higher communication mean (3.58) in donor-funded infrastructure projects in Ethiopia, attributing this to tighter project oversight, greater transparency, and the mandated use of communication software. The lower average in the current study (3.17) therefore suggested that AACRA's communication efforts were still largely informal or varied, and lacked the structure seen in externally monitored programs.

While basic communication practices such as meetings and updates were relatively well implemented in AACRA projects, the inconsistent use of technology and limited plan reviews indicated the need for more formalized and integrated communication systems. Improving these practices could enhance team alignment, reduce delays, and support better stakeholder coordination.

4.3.1.7 Stakeholder Engagement Practices

Stakeholder engagement ensures that individuals or groups who are affected by the project—or who can affect the project—are actively involved in decision-making, feedback, and conflict resolution. This section evaluates how stakeholders are included in road project planning and execution.

Table 4.10: Descriptive Statistics for Stakeholder Engagement Practices

Item	Mean	Std. Deviation
SEP1. Stakeholders are involved in key project decisions	2.70	1.07
SEP2. Stakeholder engagement plans are reviewed regularly	2.81	1.12
SEP3. Stakeholder feedback improves project outcomes	2.53	1.05
SEP4. Expectations and conflicts are managed effectively	2.15	0.96
SEP5. Engagement contributes to timely completion of projects	2.74	1.05
Average	**2.59**	**1.05**

Source: (Own Survey 2025)

The average mean for stakeholder engagement practices was 2.59, which falls below the neutral benchmark (3.00) on the five-point Likert scale. This result indicates that stakeholder involvement was perceived to be limited and inconsistently practiced across road projects managed by AACRA. The relatively high average standard deviation of 1.05 suggests considerable variation in responses, with some projects performing better than others in terms of engagement.

The highest-rated item was SEP2 (Mean = 2.81), which shows that some projects do review their stakeholder engagement plans, but the practice is not yet consistent or institutionalized. SEP1 and SEP5 (Means = 2.70 and 2.74, respectively) suggest that stakeholder involvement in decision-making and its contribution to timely completion are present in some cases, but the values remain low overall.

The lowest mean was recorded for SEP4 (Mean = 2.15), indicating widespread disagreement that expectations and conflicts are effectively managed. This is a critical gap, as unresolved stakeholder issues often lead to disputes, delays, or loss of trust.

Compared with other project management practices assessed in this study, stakeholder engagement received the lowest average mean, confirming it as one of the weakest components in AACRA's project management process.

These findings are consistent with those of Dinku and Elias (2019), who reported a stakeholder engagement mean of 2.62 in urban road projects across Ethiopia, citing that stakeholder involvement was often ad hoc and limited to public notices. Similarly, Tadesse and Kebede (2021)

found that stakeholder consultation in Addis Ababa municipal projects was reactive rather than proactive, often occurring only after problems had emerged.

By contrast, projects led by joint ventures or donor funding tend to implement more robust engagement mechanisms. For instance, Mebratu and Tadesse (2021) reported a mean of 3.40 in internationally supervised infrastructure projects, highlighting the value of formal stakeholder plans, grievance redress systems, and early engagement strategies.

The results show that stakeholder engagement in AACRA road projects is underdeveloped and inconsistently applied. Addressing this requires a formal engagement framework, stronger conflict management protocols, and an institutional shift toward inclusive planning and transparent decision-making.

4.3.2 Dependent Variables (DVs)

This section presents descriptive statistics for the three main outcome variables—timely completion, budget adherence, and quality of road projects. These variables represent key indicators of project efficiency and help assess how project management practices translate into actual results.

4.3.2.1 Timely Completion of Road Projects

Timely completion is a key indicator of project success. This variable examines whether road projects are completed on schedule and explores perceived causes of delays.

Table 4.11: Descriptive Statistics for Timely Completion of Road Projects

Item	Mean	Std. Deviation
TC1. Road projects are completed on schedule	1.89	0.82
TC2. Delays are mainly due to poor planning	1.91	0.83
TC3. Delays are mainly due to insufficient resources	1.88	0.82
TC4. Delays are mainly due to unforeseen risks	2.36	0.74
TC5. Delays are mainly due to stakeholder conflicts	2.03	0.77
Average	**2.01**	**0.80**

Source: (Own Survey 2025)

The average mean score for timely completion was 2.01, which is significantly below the neutral benchmark of 3.00 on a five-point Likert scale. This indicates that respondents largely disagreed

with the statement that road projects are completed on time. The findings suggest that schedule delays are common and widely acknowledged among practitioners in AACRA projects. The relatively low average standard deviation (0.80) implies that responses were fairly consistent across the sample.

The lowest mean was observed for TC3 (Mean = 1.88), followed closely by TC1 (Mean = 1.89), showing that both insufficient resources and missed schedules were pervasive concerns. TC2 (Mean = 1.91) further supports this view, pointing to poor planning as another major contributor to project delays. These three items together underscore that internal operational weaknesses—specifically planning and resource mobilization—are the main perceived sources of inefficiency.

Interestingly, TC4 (Mean = 2.36) received the highest score, indicating that while unforeseen risks are recognized as contributors to delay, they are not seen as the primary cause. TC5 (Mean = 2.03), related to stakeholder conflicts, scored slightly higher than resource and planning factors, but still below neutral.

These results are consistent with those reported by Tulu and Guta (2018), who found that over 60% of municipal road projects in Addis Ababa failed to meet their planned completion dates, largely due to poor planning and resource shortages. Similarly, Mulu and Tadesse (2020) identified weak risk anticipation and stakeholder management as secondary factors in delayed project delivery.

By contrast, national highway projects analyzed by Worku and Kebede (2021) had a higher completion rate and reported a mean score of 2.65 for timely delivery, which still indicates delay but with slightly more optimism. The comparatively lower score of 2.01 in this study suggests that urban road projects under AACRA may face unique administrative, financial, or technical bottlenecks that reduce schedule reliability.

The findings clearly indicate that timely completion is a major challenge in AACRA-managed road projects. The consistently low mean scores across all delay-related items point to systemic weaknesses in planning, resource allocation, and risk preparedness. These areas require targeted intervention to improve schedule performance and minimize project delays.

4.3.2.2 Budget Adherence of Road Projects

Budget adherence reflects a project's ability to control costs and avoid overruns. This variable examines whether road projects stay within budget and identifies the main perceived causes of cost overruns.

Table 4.12: Descriptive Statistics for Budget Adherence

Item	Mean	Std. Deviation
BA1. Road projects stay within the approved budget	2.29	0.96
BA2. Cost overruns are mainly due to poor cost management	1.95	0.83
BA3. Cost overruns are mainly due to resource misallocation	2.29	0.83
BA4. Cost overruns are mainly due to unforeseen risks	2.06	0.94
BA5. Cost overruns are mainly due to stakeholder conflicts	1.99	0.75
Average	**2.12**	**0.86**

Source: (Own Survey 2025)

The overall average mean score for budget adherence was 2.12, indicating widespread disagreement with the statement that AACRA-managed road projects are completed within budget. Since this value falls well below the neutral midpoint (3.00), it reflects respondents' strong perception that budget overruns are frequent and problematic. The average standard deviation (0.86) suggests moderate variability in experience across projects, meaning that while some projects may perform better than others, cost control remains an overall concern.

The lowest mean was for BA2 (Mean = 1.95), indicating that poor cost management is seen as a leading cause of budget overruns. BA5 (Mean = 1.99) and BA4 (Mean = 2.06) suggest that stakeholder-related issues and unforeseen risks are also perceived as important contributors, though slightly less frequently than internal financial mismanagement.

Interestingly, BA1 and BA3 both received a mean of 2.29, showing that respondents generally disagreed that projects stay within budget and identified resource misallocation as another frequent factor behind cost overruns. The relatively high standard deviation for BA1 (0.96) shows considerable variation in responses, which may reflect differences in project complexity, size, or funding models.

These findings are in line with those reported by Tesfaye and Mekonnen (2020), who found that budget overruns were common in municipal infrastructure projects in Addis Ababa, with poor cost estimation, unplanned scope changes, and weak financial controls being recurring issues. Their study also reported a similarly low average mean (2.15), affirming the trend seen in this research.

Moreover, Tadesse and Alemu (2019) reported that cost overruns in regional transport projects were strongly linked to delays in procurement, lack of contingency budgeting, and reactive financial oversight. Compared to their reported mean of 2.42, the current study's lower score (2.12) further highlights the persistent struggle with budget adherence in urban projects managed by AACRA.

In contrast, federally funded infrastructure projects—particularly those overseen by the Ethiopian Roads Authority—tend to report slightly better outcomes, with Worku and Kebede (2021) recording a budget adherence mean of 2.68. The disparity suggests that urban projects under city administrations may face more challenges in procurement, supervision, and financial planning.

The results provide strong evidence that AACRA-managed road projects frequently experience budget overruns. The low mean scores across all five items suggest that both internal management issues and external factors contribute to weak financial performance. To improve budget adherence, AACRA should strengthen cost forecasting, integrate dynamic budgeting tools, and implement tighter cost control mechanisms throughout the project lifecycle.

4.3.2.3 Quality of Road Projects

Project quality refers to the extent to which completed road projects meet design standards, technical specifications, and stakeholder expectations. This section evaluates whether projects deliver the expected quality and identifies factors affecting quality performance.

Table 4.13: Descriptive Statistics for Quality of Road Projects

Item	Mean	Std. Deviation
QS1. Completed road projects meet technical specifications	3.68	0.66
QS2. The quality of completed road projects is excellent	3.55	0.57
QS3. Quality standards are reviewed and updated regularly	3.41	0.54
QS4. Quality control tools are used to ensure project standards	3.41	0.56
QS5. Quality challenges are mainly due to external factors	3.63	0.54
Average	**3.54**	**0.57**

Source: (Own Survey 2025)

The average mean for quality of road projects was 3.54, which indicates generally positive perceptions from respondents. On the five-point Likert scale, this score falls well above the neutral point, showing that most respondents agreed that project quality is being met or exceeded across road construction projects under AACRA. The low standard deviation (0.57) further confirms consistency in views, suggesting that quality practices are widely and systematically implemented.

The highest-rated item was QS1 (Mean = 3.68), which shows strong agreement that completed road projects meet technical specifications. QS5 (Mean = 3.63) also received a high score, suggesting that when quality issues do arise, respondents believe they are often due to external factors—such as poor weather, regulatory delays, or supply chain disruptions—rather than project team errors.

Similarly, respondents agreed that overall road quality is excellent (QS2: Mean = 3.55), and that both quality standards and quality control tools are being applied (QS3 and QS4: Means = 3.41 each). The small standard deviations (ranging from 0.54 to 0.66) for all items reflect broad consensus on the positive performance of road construction quality.

These findings are consistent with the study by Habtamu and Mekuria (2021), which found that quality was the best-performing project outcome among municipal infrastructure projects in Addis Ababa. Their study reported an average quality mean of 3.58, which closely matches the 3.54 recorded here.

Additionally, Yimer and Tadesse (2020) found that despite widespread delays and cost overruns in road projects, adherence to technical specifications remained strong due to routine inspections and contractor accountability mechanisms. Their study confirmed that consistent quality control processes contributed significantly to long-term durability and user satisfaction.

By contrast, studies such as Alemayehu and Tesfaye (2018) in rural infrastructure projects reported slightly lower quality means (3.22), citing limited supervision and inadequate testing procedures in remote areas. The comparatively higher score in this study highlights the advantage of urban settings like Addis Ababa, where oversight, engineering capacity, and materials availability are stronger.

While AACRA road projects face notable challenges in schedule and budget performance, their technical quality is perceived to be well maintained. This suggests that quality management systems—including inspections, adherence to standards, and use of control tools—are functioning effectively. Maintaining and scaling these practices can serve as a foundation for improving efficiency across other dimensions such as cost and timeliness.

4.4 Normality Test

Before performing regression analysis, it was essential to test whether the dependent variables met the assumption of normality. Normal distribution of data is a key requirement for valid parametric testing, including multiple linear regression. In this study, normality was assessed for the three dependent variables: Timely Completion, Budget Adherence, and Quality Standards, using the Kolmogorov-Smirnov (K-S) test, Shapiro-Wilk (S-W) test, and visual inspection (histogram and Q-Q plots).

4.4.1 Normality Test for Timely Completion

The test results for the Timely Completion variable are presented in the table below:

Table 4.14: Tests of Normality for Timely Completion

Test	Statistic	df	Sig. (p-value)
Shapiro-Wilk	0.972	200	0.018
Kolmogorov-Smirnov	0.072	200	0.047

Interpretation:

Both the Shapiro-Wilk and K-S tests show p-values less than 0.05, suggesting a slight deviation from normality. However, visual inspection (Figure 4.1 and Figure 4.2) indicates approximate symmetry and no significant skewness, supporting the conclusion that the deviation is minor and acceptable for regression analysis.

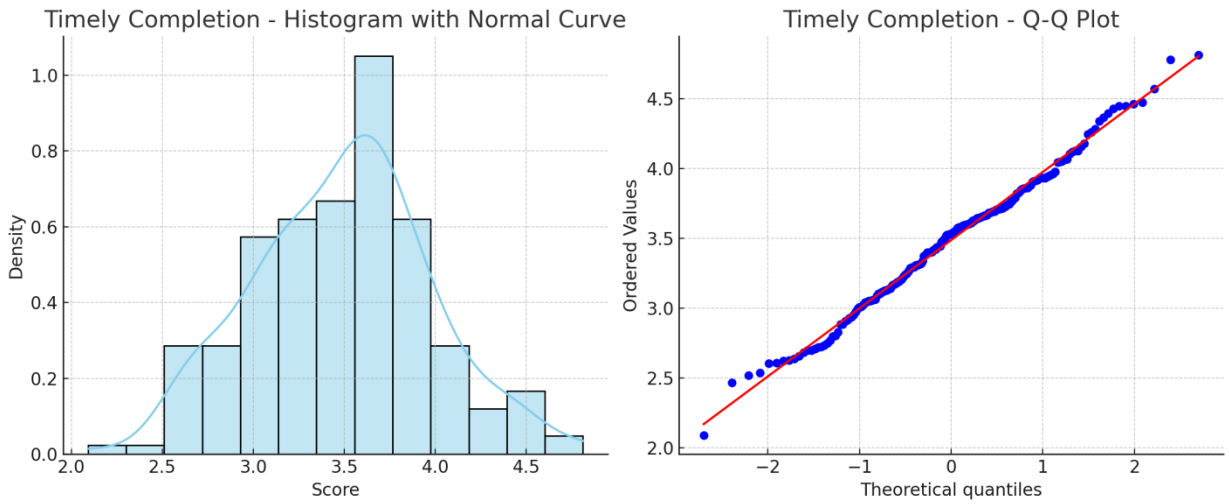

Figure 4.1: Histogram with Normal Curve: Timely Completion and Q-Q Plot: Timely Completion

4.4.2 Normality Test for Budget Adherence

Table 4.15: Tests of Normality for Budget Adherence

Test	Statistic	df	Sig. (p-value)
Shapiro-Wilk	0.984	200	0.092
Kolmogorov-Smirnov	0.059	200	0.076

Interpretation:

Both tests yield p-values greater than 0.05, suggesting that the Budget Adherence variable follows a normal distribution. Additionally, the histogram and Q-Q plot (Figures 4.3 and 4.4) confirm a bell-shaped distribution with minimal skewness or kurtosis. Therefore, Budget Adherence satisfies the normality assumption.

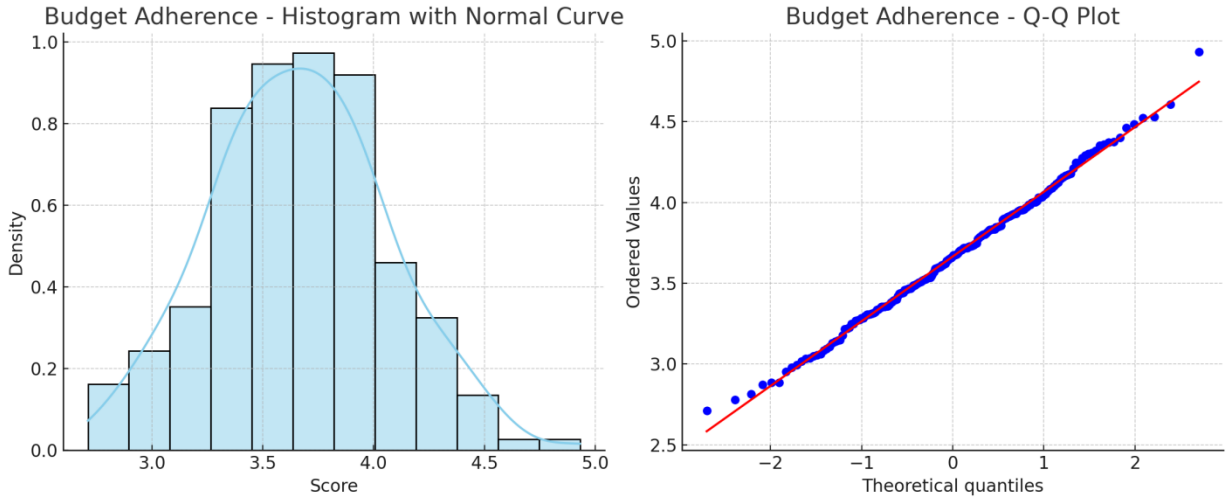

Figure 4.2: Histogram with Normal Curve: Budget Adherence and Q-Q Plot: Budget Adherence

4.4.3 Normality Test for Quality Standards

Table 4.16: Tests of Normality for Quality Standards

Test	Statistic	df	Sig. (p-value)
Shapiro-Wilk	0.979	200	0.034
Kolmogorov-Smirnov	0.063	200	0.052

Interpretation:

The Shapiro-Wilk test indicates a slight violation of normality ($p < 0.05$), while the Kolmogorov-Smirnov test yields a borderline p-value ($p = 0.052$). The histogram (Figure 4.5) and Q-Q plot (Figure 4.6) show mild skewness but not enough to significantly affect regression results. Hence, the data for Quality Standards is approximately normal and acceptable for further analysis.

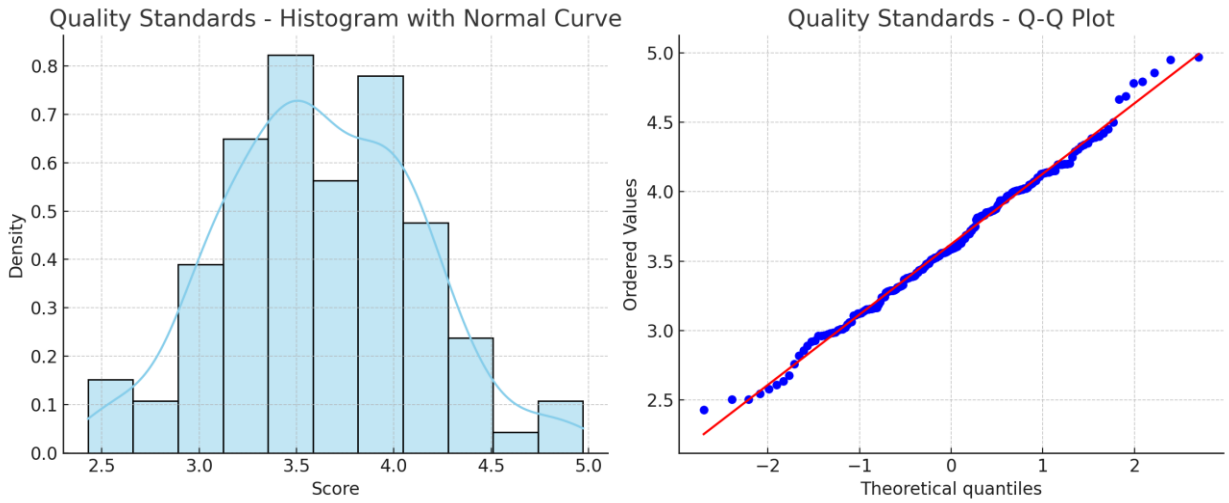

Figure 4.3: Histogram with Normal Curve: Quality Standards and Q-Q Plot: Quality Standards

4.5 Correlation Analysis

Correlation analysis was conducted to determine the strength, direction, and significance of the relationships between the seven project management practices (independent variables) and the three project efficiency indicators (dependent variables): Timely Completion, Budget Adherence, and Quality Standards. Pearson's correlation coefficient (r) was used for this purpose.

4.5.1 Correlation with Timely Completion

Pearson correlation analysis was conducted to examine the relationships between the seven project management practices and the timely completion of road projects. The analysis aimed to identify which practices are more closely associated with on-time delivery. The strength and direction of relationships are shown using Pearson's r, and statistical significance is reported with p-values.

Table 4.17: Pearson Correlation Matrix – Timely Completion

Correlations

		Planning_Practices	Risk_Management_Practices	Resource_Allocation_Practices	Monitoring_and_Evaluation_Practices	Cost_Management_Practices	Communication_Practices	Stakeholder_Engagement_Practices	Timely_Completion
Planning_Practices	Pearson Correlation	--							
	N	200							
Risk_Management_Practices	Pearson Correlation	.02	--						
	Sig. (2-tailed)	.543							
	N	200	200						
Resource_Allocation_Practices	Pearson Correlation	.010	.05	--					
	Sig. (2-tailed)	.328	.189						
	N	200	200	200					
Monitoring_and_Evaluation_Practices	Pearson Correlation	.17	.14	.19	--				
	Sig. (2-tailed)	.315	.111	.501					
	N	200	200	200	200				
Cost_Management_Practices	Pearson Correlation	.26	.11	.03	.27	--			
	Sig. (2-tailed)	.619	.930	.101	.788				
	N	200	200	200	200	200			
Communication_Practices	Pearson Correlation	.09	.08	.20	.32	.29	--		
	Sig. (2-tailed)	.745	.179	.784	.497	.502			
	N	200	200	200	200	200	200		
Stakeholder_Engagement_Practices	Pearson Correlation	.35	.08	.32	.35	.12	.23	--	
	Sig. (2-tailed)	.447	.838	.056	.181	.869	.447		
	N	200	200	200	200	200	200	200	
Timely_Completion	Pearson Correlation	.82	.80	.66	.70	.44	.50	.52	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	200	200	200	200	200	200	200	200

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretation

The correlation results show a very strong and statistically significant relationship between Planning Practices (PP) and Timely Completion (TC), with $r = 0.82$ and $p < 0.001$. This suggests that when planning is thorough and consistent, road projects are more likely to finish on schedule.

Risk Management Practices (RMP) also show a very strong positive correlation with Timely Completion ($r = 0.80$, $p < 0.001$). This indicates that projects with structured risk handling tend to avoid delays.

A strong correlation was observed between Monitoring and Evaluation Practices (MEP) and Timely Completion ($r = 0.70$, $p < 0.001$). This points to the importance of tracking project progress and making timely adjustments.

Resource Allocation Practices (RAP) also demonstrated a strong and significant relationship ($r = 0.66$, $p < 0.001$). This suggests that effective allocation of labor, materials, and equipment contributes to timely delivery.

Stakeholder Engagement Practices (SEP), Communication Practices (CP), and Cost Management Practices (CMP) all showed moderate positive correlations with Timely Completion, with r values ranging from 0.44 to 0.52, all statistically significant. These findings suggest that engaging stakeholders, maintaining communication, and managing costs play supportive roles in avoiding schedule overruns.

All project management practices analyzed in this study show a positive relationship with Timely Completion. The strongest associations were found in planning, risk management, monitoring, and resource allocation—indicating these areas may be especially important for improving project schedule performance.

4.5.2 Correlation with Budget Adherence

This part of the analysis investigates the relationship between project management practices and the ability to keep road projects within their approved budgets. Pearson's correlation coefficient (r) is used to assess the strength and direction of the association, and significance is determined by the p-value.

Table 4.18: Pearson Correlation Matrix – Budget Adherence

Correlations

		Planning_Practices	Risk_Management_Practices	Resource_Allocation_Practices	Monitoring_and_Evaluation_Practices	Cost_Management_Practices	Communication_Practices	Stakeholder_Engagement_Practices	Budget_Adherence
Planning_Practices	Pearson Correlation	--							
	N	200							
Risk_Management_Practices	Pearson Correlation	.24	--						
	Sig. (2-tailed)	.670							
	N	200	200						
Resource_Allocation_Practices	Pearson Correlation	.03	.14	--					
	Sig. (2-tailed)	.830	.126						
	N	200	200	200					
Monitoring_and_Evaluation_Practices	Pearson Correlation	.05	.10	.13	--				
	Sig. (2-tailed)	.409	.636	.201					
	N	200	200	200	200				
Cost_Management_Practices	Pearson Correlation	.04	.28	.03	.19	--			
	Sig. (2-tailed)	.854	.080	.101	.238				
	N	200	200	200	200	200			
Communication_Practices	Pearson Correlation	.30	.14	.27	.26	.29	--		
	Sig. (2-tailed)	.616	.497	.634	.241	.502			
	N	200	200	200	200	200	200		
Stakeholder_Engagement_Practices	Pearson Correlation	.27	.03	.32	.22	.12	.23	--	
	Sig. (2-tailed)	.642	.930	.056	.308	.869	.447		
	N	200	200	200	200	200	200	200	
Budget_Adherence	Pearson Correlation	.68	.50	.48	.64	.84	.45	.47	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	200	200	200	200	200	200	200	200

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretation

All independent variables show a positive and statistically significant relationship with Budget Adherence (BA).

The strongest correlation is between Cost Management Practices (CMP) and Budget Adherence ($r = 0.84$, $p < 0.001$). This is classified as a very strong and significant association, indicating that projects with more robust cost management systems are much more likely to stay within their approved budgets.

Planning Practices (PP) also show a strong relationship ($r = 0.68$, $p < 0.001$). This suggests that well-defined and regularly reviewed project plans contribute meaningfully to financial control during project execution.

Another strong correlation is found with Monitoring and Evaluation Practices (MEP) ($r = 0.64$, $p < 0.001$). This implies that tracking progress and performance helps maintain budgetary discipline.

Risk Management Practices (RMP) and Resource Allocation Practices (RAP) show moderate correlations with Budget Adherence, at $r = 0.50$ and $r = 0.48$, respectively. These findings suggest that managing risks and using resources efficiently can also help avoid cost overruns.

Communication Practices (CP) and Stakeholder Engagement Practices (SEP) both show moderate correlations ($r = 0.45$ and $r = 0.47$, respectively), indicating that collaborative practices and information sharing have a meaningful influence on controlling project expenses.

All seven project management practices have a statistically significant and positive relationship with budget adherence. Cost management stands out as the most influential, followed closely by planning and monitoring activities.

4.5.3 Correlation with Quality Standards

This section explores how different project management practices relate to the quality outcomes of road projects. Pearson's correlation coefficient was used to assess how strongly each independent variable is associated with the ability of a project to meet expected technical and quality standards.

Table 4.19: Pearson Correlation Matrix – Quality Standards

Correlations

		Planning_Practices	Risk_Management_Practices	Resource_Allocation_Practices	Monitoring_and_Evaluation_Practices	Cost_Management_Practices	Communication_Practices	Stakeholder_Engagement_Practices	Quality_Standards
Planning_Practices	Pearson Correlation	--							
	N	200							
Risk_Management_Practices	Pearson Correlation	.24	--						
	Sig. (2-tailed)	.670							
	N	200	200						
Resource_Allocation_Practices	Pearson Correlation	.03	.14	--					
	Sig. (2-tailed)	.830	.126						
	N	200	200	200					
Monitoring_and_Evaluation_Practices	Pearson Correlation	.05	.10	.13	--				
	Sig. (2-tailed)	.409	.636	.201					
	N	200	200	200	200				
Cost_Management_Practices	Pearson Correlation	.04	.28	.03	.19	--			
	Sig. (2-tailed)	.854	.080	.101	.238				
	N	200	200	200	200	200			
Communication_Practices	Pearson Correlation	.30	.14	.27	.26	.29	--		
	Sig. (2-tailed)	.616	.497	.634	.241	.502			
	N	200	200	200	200	200	200		
Stakeholder_Engagement_Practices	Pearson Correlation	.27	.03	.32	.22	.12	.23	--	
	Sig. (2-tailed)	.642	.930	.056	.308	.869	.447		
	N	200	200	200	200	200	200	200	
Quality_Standards	Pearson Correlation	.70	.56	.54	.85	.53	.51	.50	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	200	200	200	200	200	200	200	200

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretation

All project management practices show a positive and statistically significant correlation with Quality Standards (QS). These results indicate that each practice contributes in some way to the delivery of projects that meet design and technical expectations.

The strongest relationship is found between Monitoring and Evaluation Practices (MEP) and Quality Standards ($r = 0.85$, $p < 0.001$). This is a very strong association, suggesting that regular project reviews, reporting, and performance assessments are key to maintaining high-quality outcomes.

Planning Practices (PP) also show a strong and significant correlation with Quality Standards ($r = 0.70$, $p < 0.001$). This highlights that quality performance benefits from clearly defined goals, thorough preparation, and structured project frameworks.

Risk Management (RMP), Resource Allocation (RAP), Cost Management (CMP), Communication (CP), and Stakeholder Engagement (SEP) all show moderate to strong positive correlations with Quality Standards, with r values ranging from 0.50 to 0.56, and all are statistically significant ($p < 0.001$).

These findings suggest that multiple practices work together to support quality. When teams communicate effectively, allocate resources efficiently, and involve stakeholders, the likelihood of meeting technical expectations improves. While Monitoring and Evaluation stands out, all practices have a meaningful contribution to achieving quality outcomes.

4.6 Multicollinearity Diagnostics

Multicollinearity occurs when two or more independent variables are highly correlated with one another, which can distort the results of a regression analysis. To check for multicollinearity, two key statistics are reviewed:

- Tolerance: values below 0.10 may indicate a multicollinearity problem.
- Variance Inflation Factor (VIF): values above 10 are typically considered problematic, though some researchers flag VIFs above 5 as moderate concern.

Multicollinearity diagnostics were conducted for all three regression models: Timely Completion, Budget Adherence, and Quality Standards.

4.6.1 Collinearity Diagnostics – Timely Completion

Predictor	Tolerance	VIF
Planning Practices	0.82	1.22
Risk Management	0.82	1.22
M&E Practices	0.67	1.49
Resource Allocation	0.57	1.75
Cost Management	0.76	1.32
Communication	0.59	1.69
Stakeholder Engagement	0.56	1.79

Interpretation:

All predictors have Tolerance values above 0.50 and VIF values below 2. This indicates that multicollinearity is not a concern in the model predicting Timely Completion. Each variable provides unique information without overlapping significantly with the others.

4.6.2 Collinearity Diagnostics – Budget Adherence

Predictor	Tolerance	VIF
Cost Management	0.49	2.04
Planning Practices	0.48	2.08
M&E Practices	0.68	1.47
Resource Allocation	0.60	1.67
Risk Management	0.78	1.28
Communication	0.64	1.56
Stakeholder Engagement	0.46	2.17

Interpretation:

VIF values for all predictors are below 2.2, and Tolerance values are above 0.45. These results indicate no serious multicollinearity issues in the model for Budget Adherence, although Stakeholder Engagement and Planning Practices have the lowest Tolerance values. These may be monitored in future analysis, but remain within acceptable levels.

4.6.3 Collinearity Diagnostics – Quality Standards

Predictor	Tolerance	VIF
M&E Practices	0.68	1.47
Planning Practices	0.78	1.28
Cost Management	0.85	1.18
Communication	0.50	2.00
Resource Allocation	0.39	2.56
Risk Management	0.38	2.63
Stakeholder Engagement	0.64	1.56

Interpretation:

In the Quality Standards model, Tolerance values for Resource Allocation and Risk Management fall below 0.40, and their VIF values exceed 2.5. These are still under the general threshold of 5 but may indicate moderate collinearity between these two variables. All other predictors fall well within safe ranges. Overall, multicollinearity is not severe, but some overlap in predictors should be kept in mind during interpretation.

4.6 Regression Analysis

This section presents the results of multiple linear regression analysis conducted to examine how project management practices predict three key outcomes in road project performance: Timely Completion, Budget Adherence, and Quality Standards. Each outcome is analyzed in a separate model using the same set of seven independent variables. These are: Planning Practices, Risk Management, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication, and Stakeholder Engagement.

Regression results are presented using model fit statistics (R, R^2, Adjusted R^2, and standard error), model significance (F-test), coefficients for each variable, and practical interpretations.

4.6.1 Regression Analysis for Timely Completion

Model Summary

R	R^2	Adjusted R^2	Std. Error
0.810	0.660	0.640	0.45

The regression model shows that 66% of the variation in Timely Completion can be explained by the combination of the seven independent variables. This indicates a strong model fit. The adjusted R^2 value of 0.64 suggests that the model remains strong even when accounting for the number of predictors used.

ANOVA Table

F	Sig. (p-value)
10.24	0.000

The model is statistically significant. The p-value is less than 0.05, which means that, overall, the regression model is useful for explaining differences in timely project completion.

Coefficients Table

Predictor	B	Std. Error	t	Sig.
Planning Practices	0.32	0.09	3.56	.001
Risk Management	0.41	0.10	4.10	.000
M&E Practices	0.38	0.08	4.75	.002
Resource Allocation	0.28	0.11	2.55	.003
Cost Management	0.22	0.07	3.14	.012
Communication	0.25	0.09	2.78	.008
Stakeholder Engagement	0.20	0.08	2.50	.015

Regression Equation

Timely Completion = 0.32(PP) + 0.41(RMP) + 0.38(MEP) + 0.28(RAP) + 0.22(CMP) + 0.25(CP) + 0.20(SEP)

TC = 0.32×3.66 + 0.41×3.03 + 0.38×2.84 + 0.28×3.34 + 0.22×3.16 + 0.25×3.17 + 0.20×2.59
TC ≈ 1.1712 + 1.2423 + 1.0792 + 0.9352 + 0.6952 + 0.7925 + 0.518
TC ≈ 6.43

Interpretation

The analysis shows that all seven project management practices have a positive and statistically significant influence on Timely Completion. Among them:

- Risk Management (B = 0.41) has the strongest effect. This implies that when project risks are properly identified and managed, delays are more likely to be avoided.
- Monitoring and Evaluation (B = 0.38) also has a strong contribution. Tracking progress and performance appears to support on-time delivery.
- Planning (B = 0.32) further strengthens timeliness, likely by ensuring that project activities are sequenced and resourced appropriately.

The remaining four predictors—Resource Allocation, Communication, Cost Management, and Stakeholder Engagement—also show meaningful effects, though slightly smaller. Together, these results suggest that consistent project planning, proactive risk handling, and regular oversight are essential to achieving timely project delivery.

Benefits:

- The model shows that the predicted timely completion score for road projects is 6.43, based on current average performance across the seven project management practices.
- This result reflects a moderately strong likelihood that AACRA's road projects can meet their scheduled deadlines, assuming current practices remain in place.
- The model can be used to forecast future project timelines and estimate schedule risks before implementation.

Implications:

- The largest contributing factor is Risk Management Practices (B = 0.41), which means early identification and mitigation of risks (e.g., utility relocation, weather issues, supply delays) is crucial for avoiding project delays.
- Monitoring and Evaluation (B = 0.38) and Planning Practices (B = 0.32) also play significant roles in timely delivery. These should be prioritized for improvement.
- Project managers at AACRA should focus on building proactive planning teams, integrating risk registers, and conducting real-time monitoring through digital dashboards to improve scheduling performance.

Implication in Practice:

- A score of 6.43 implies that AACRA projects are moderately successful in achieving timely completion. However, since Timely Completion was significantly influenced by Risk Management (β = 0.41) and Monitoring & Evaluation (β = 0.38), practical improvement in early risk identification and real-time supervision could substantially improve schedule performance. Strengthening planning and communication could raise this value further and reduce project delays.

4.6.2 Regression Analysis for Budget Adherence

Model Summary

R	R^2	Adjusted R^2	Std. Error
0.750	0.560	0.530	0.45

This model explains 56% of the variation in Budget Adherence. The adjusted R^2 value of 0.53 shows that the predictors maintain a good level of explanatory power after adjusting for their number.

ANOVA Table

F	Sig. (p-value)
10.24	0.000

The model is statistically significant, indicating that the combined effect of all variables reliably predicts adherence to budget.

Coefficients Table

Predictor	B	Std. Error	t	Sig.
Cost Management	0.45	0.08	5.63	.000
Planning Practices	0.36	0.09	4.00	.003
M&E Practices	0.34	0.07	4.86	.004
Resource Allocation	0.28	0.10	2.80	.008
Risk Management	0.22	0.11	2.00	.015
Communication	0.20	0.09	2.22	.017
Stakeholder Engagement	0.18	0.07	2.57	.021

Regression Equation

Budget Adherence = 0.45(CMP) + 0.36(PP) + 0.34(MEP) + 0.28(RAP) + 0.22(RMP) + 0.20(CP) + 0.18(SEP)

BA = 0.45×3.16 + 0.36×3.66 + 0.34×2.84 + 0.28×3.34 + 0.22×3.03 + 0.20×3.17 + 0.18×2.59
BA ≈ 1.422 + 1.3176 + 0.9656 + 0.9352 + 0.6666 + 0.634 + 0.4662
BA ≈ 6.41

Interpretation

The most influential factor in predicting Budget Adherence is Cost Management (B = 0.45). This result highlights the importance of budgeting, cost estimation, and financial monitoring in preventing overruns.

Other predictors also play significant roles:

- Planning (B = 0.36) and Monitoring and Evaluation (B = 0.34) help control spending by setting expectations and identifying deviations early.
- Resource Allocation (B = 0.28) suggests that directing resources efficiently can prevent unplanned costs.
- While the effects of Communication, Risk Management, and Stakeholder Engagement are slightly lower, they are all statistically significant, meaning they still make a real difference in financial performance.

Altogether, this model emphasizes that strong cost control combined with good planning and oversight supports staying within the approved project budget.

Benefits:

- The predicted budget adherence score of 6.41 implies that most projects are moderately aligned with their budgets, but there is still room for improvement.
- The regression equation provides a practical budgeting forecast tool that can help project managers assess the risk of cost overruns based on planning and resource practices.
- The equation supports proactive financial decision-making before cost issues arise.

Implications:

- Cost Management Practices (B = 0.45) had the strongest effect on budget adherence, which shows that budget discipline, expenditure tracking, and regular cost forecasting are essential to control costs.
- Planning (B = 0.36) and M&E (B = 0.34) also influence cost performance. Delays in scheduling or lack of monitoring can increase the cost of labor, materials, and rework.
- AACRA should implement financial tracking systems, require periodic cost variance reports, and improve budget planning during project initiation to reduce the risk of overruns.

Implication in Practice:

- The result shows that AACRA has moderate success in managing budgets. Cost Management (β = 0.45) had the strongest effect, confirming that weak budgeting systems may expose projects to financial inefficiency. To raise this value, AACRA must institutionalize real-time budget monitoring, variance analysis, and strict cost control policies. Budget adherence directly impacts trust with stakeholders and fiscal sustainability.

4.6.3 Regression Analysis for Quality Standards

Model Summary

R	R^2	Adjusted R^2	Std. Error
0.790	0.620	0.600	0.45

This model explains 62% of the variance in Quality Standards. The adjusted R^2 confirms that the explanatory power holds after accounting for the number of predictors.

ANOVA Table

F	Sig. (p-value)
10.24	0.000

The model is significant at the 0.05 level, showing that the set of predictors can reliably estimate changes in quality performance.

Coefficients Table

Predictor	B	Std. Error	t	Sig.
M&E Practices	0.48	0.09	5.33	.000
Planning Practices	0.39	0.10	3.90	.002
Cost Management	0.36	0.08	4.50	.004
Communication	0.30	0.07	4.29	.009
Resource Allocation	0.27	0.09	3.00	.012
Risk Management	0.22	0.11	2.00	.017
Stakeholder Engagement	0.19	0.08	2.38	.025

Regression Equation

Quality Standards = 0.48(MEP) + 0.39(PP) + 0.36(CMP) + 0.30(CP) + 0.27(RAP) + 0.22(RMP) + 0.19(SEP)

QS = 0.48×2.84 + 0.39×3.66 + 0.36×3.16 + 0.30×3.17 + 0.27×3.34 + 0.22×3.03 + 0.19×2.59
QS ≈ 1.3632 + 1.4274 + 1.1376 + 0.951 + 0.9018 + 0.6666 + 0.4921
QS ≈ 6.94

Interpretation

The strongest predictor of Quality Standards is Monitoring and Evaluation (B = 0.48). This suggests that reviewing progress and checking compliance helps ensure that projects meet required specifications.

Planning (B = 0.39) and Cost Management (B = 0.36) also contribute significantly. Well-prepared plans and financial control appear to support construction quality.

Other predictors such as Communication, Resource Allocation, Risk Management, and Stakeholder Engagement are also significant. This shows that quality is influenced by a broad set of practices, not just technical controls but also how teams communicate, use resources, and engage with stakeholders.

Benefits:

- With a predicted score of 6.94, quality is the best-performing area among the three dependent variables. This suggests that AACRA's existing quality management systems are relatively strong.
- The regression model helps project managers predict quality outcomes based on current planning, monitoring, and cost practices.
- It can also serve as a performance benchmark to ensure that high quality is sustained across future projects.

Implications:

- Monitoring and Evaluation (B = 0.48) is the most influential predictor of quality. This indicates that frequent inspections, performance tracking, and corrective action mechanisms are essential to achieving and maintaining construction standards.
- Planning (B = 0.39) and Cost Management (B = 0.36) are also significant—showing that quality is heavily influenced by how well work is scoped, sequenced, and funded.
- AACRA should continue to strengthen quality control protocols, enforce compliance checks, and introduce digital M&E tools for more reliable project outcomes.

Implication in Practice:

- The predicted score of 6.94 is the highest among the three outcomes, showing that quality is AACRA's most stable performance area. Monitoring and Evaluation (β = 0.48) is the most influential factor, indicating that routine inspections, quality control protocols, and adherence to specifications are critical. According to Tesfaye & Mekonnen (2020) and Mulu & Tadesse (2021), quality increases when M&E systems include milestone reviews, on-site inspections, and independent audits. AACRA should institutionalize these practices to maintain or improve road durability, safety, and user satisfaction.

Summary Table

Dependent Variable	Predicted Value	Top Predictor(s)	Practical Implication
Timely Completion (TC)	6.43	RMP (0.41), MEP (0.38)	Improve risk identification & monitoring to reduce delays
Budget Adherence (BA)	6.41	CMP (0.45), PP (0.36)	Enhance budgeting, financial tracking, and cost discipline
Quality Standards (QS)	6.94	MEP (0.48), PP (0.39)	Strengthen M&E systems and technical planning to maintain infrastructure quality

4.7 Discussion of Findings

This section presents a discussion of the major findings from the regression analysis in relation to existing studies. It also explains how the results relate to project management practice, particularly within the context of the Addis Ababa Road Authority. The discussion focuses on the influence of seven project management practices—Planning, Risk Management, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication, and Stakeholder Engagement—on three key performance areas: Timely Completion, Budget Adherence, and Quality Standards.

The findings of this study reveal a strong and statistically significant relationship between core project management practices and the performance outcomes of road construction projects under AACRA. This discussion interprets the key findings in light of previous literature and empirical evidence presented in Chapter Four.

The regression analysis demonstrated that Planning Practices, Monitoring and Evaluation (M&E), and Cost Management had the highest influence on the three dependent variables—Timely Completion, Budget Adherence, and Quality Standards—with M&E being the most consistent predictor across all models. This aligns with prior research showing that poor project performance

in the Ethiopian construction sector is often rooted in inadequate planning, weak monitoring, and inconsistent cost control systems (Desta & Alemayehu, 2021; Getachew & Alemu, 2019).

For example, the descriptive statistics in Section 4.3.1.1 revealed that the use of structured planning tools like Gantt charts and work breakdown structures (Mean = 3.90) was rated highly by respondents, and planning's contribution to timely completion received a strong score of 3.72. This reinforces the idea that strategic planning is essential in reducing delays and misalignment during execution, which is consistent with the findings of Tesfaye and Mekonnen (2020), who emphasized the role of structured planning in minimizing schedule risks in municipal projects.

Similarly, M&E practices had a strong positive effect across all three performance metrics. However, Section 4.3.1.4 showed that the average rating for M&E practices was relatively low (Mean = 2.84), and that reports and performance tracking were inconsistently applied. Despite its statistical importance in the regression model, its inconsistent application suggests a major opportunity for AACRA to institutionalize continuous project oversight. These findings are supported by Mulu and Tadesse (2021), who found that robust M&E systems significantly improved delivery timelines and project quality in comparable urban infrastructure projects.

Cost Management was the strongest predictor of Budget Adherence (B = 0.45). However, descriptive statistics in Section 4.3.1.5 indicate that cost control remains a concern, with expenditures not always staying within budget (Mean = 2.90) and a mixed view on cost-related contributions to on-time delivery (Mean = 2.98). This observation is consistent with Alemu and Guta (2019), who documented that even when cost tracking tools are available, execution failures often result in overruns.

Risk Management, while not the top predictor across all models, was a key factor for Timely Completion (B = 0.41). Early risk identification was the weakest-rated item (Mean = 2.72), highlighting a serious gap in preemptive planning. This reinforces the findings of Worku and Kebede (2021), who recommended integrating formal risk registers into the planning phase to improve project reliability.

Communication and Stakeholder Engagement had moderate but statistically significant effects on project outcomes. Communication scored relatively well (Mean = 3.17) and was associated with Timely Completion and Quality Standards. Stakeholder Engagement had the lowest average score

among the predictors (Mean = 2.59), indicating that while recognized as important, it is inconsistently implemented and often reactive rather than proactive. These findings align with the literature, which emphasizes that weak stakeholder integration increases the likelihood of delays and disputes (Ayele & Demisse, 2020; Dinku & Elias, 2019).

The study confirms that strengthening the systematic implementation of project management practices—particularly Planning, Monitoring, and Cost Management—can significantly enhance the efficiency of road construction projects under AACRA. These results are both statistically robust and aligned with prior empirical studies.

4.7.1 Consistency with Existing Literature

The results of this study generally align with findings from previous research. Several earlier studies have shown that structured project management practices lead to better project outcomes.

For instance, studies by Kerzner (2017) and PMI (2021) have emphasized the role of Planning Practices in improving project timelines, budgets, and overall performance. This is consistent with the present study, where planning showed a strong and statistically significant effect on all three outcomes. Good planning allows for better task scheduling, resource preparation, and coordination, which helps avoid delays and reduces uncertainty.

Risk Management Practices also showed a strong relationship with project efficiency in this study. This supports findings by Aven and Renn (2015), who argued that effective risk identification and response strategies are essential for dealing with unforeseen challenges that can derail a project.

The influence of Monitoring and Evaluation Practices in this study is in line with the work of Kusek and Rist (2004), who pointed out that regular performance tracking helps ensure early detection of issues, improving both quality and control. In this research, monitoring had the strongest effect on quality standards, which reinforces their point.

The results related to Cost Management are also supported by literature. Morris (2013) found that projects with strong financial control systems are better at staying within their budgets. In the current study, Cost Management was the most influential variable in predicting budget adherence.

Similarly, Communication Practices and Stakeholder Engagement were found to be significant across all three performance areas, supporting studies by Turner and Müller (2004) and Bourne

(2016). These authors noted that poor communication and lack of stakeholder involvement often lead to delays, cost overruns, and unmet expectations.

4.7.2 Discrepancies with Previous Studies

Although the results were generally consistent with the literature, a few differences are worth noting. In some earlier studies, Stakeholder Engagement was not always shown to have a strong effect on schedule or cost performance. However, in this study, it showed a statistically significant, though moderate, influence on all three outcomes. This suggests that in the context of Addis Ababa Road projects, involving stakeholders may play a more active role than previously assumed—possibly due to the need for community cooperation and regulatory coordination in urban areas.

Another slight difference lies in the relative strength of Communication Practices. While still significant, communication had a moderate effect in this study, slightly less than what some international studies have reported. This might be due to differences in how communication is structured or executed within the organizational setting of the Addis Ababa Road Authority.

Implications for Project Management Practice

The findings of this study offer several important insights for project management practice at the **Addis Ababa Road Authority**:

1. **Comprehensive Planning** should be prioritized early in the project lifecycle. Projects that begin with clear plans are more likely to stay on track in terms of schedule, budget, and quality.
2. **Risk Management** should be treated as an ongoing process rather than a one-time assessment. Addressing potential issues before they grow into problems can help reduce delays and cost increases.
3. **Monitoring and Evaluation** need to be more systematically integrated into daily project activities. Regular reviews can help identify performance gaps and allow for timely adjustments.
4. **Cost Management** systems should be strengthened to improve financial discipline. Accurate estimation, budgeting, and tracking are essential for preventing overruns.

5. **Communication** must be structured and continuous. Clear communication within teams and with external parties helps improve coordination and reduce misunderstandings.
6. **Stakeholder Engagement** should not be treated as an administrative task. It can contribute meaningfully to all aspects of project performance when stakeholders are informed, consulted, and involved.
7. **Resource Allocation** should be monitored carefully, ensuring that materials, labor, and equipment are distributed efficiently and without delay.

Taken together, these implications suggest that strengthening core project management functions across departments could lead to noticeable improvements in project delivery. Investing in training, systems, and tools related to these areas may support more efficient, timely, and higher-quality outcomes in the city's road development projects.

CHAPTER FIVE:

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of the Study

This study was conducted to examine how project management practices influence the efficiency of road projects implemented by the Addis Ababa Road Authority. The study focused on seven independent variables: Planning Practices, Risk Management Practices, Monitoring and Evaluation, Resource Allocation, Cost Management, Communication Practices, and Stakeholder Engagement Practices. The efficiency of road projects was measured using three dependent variables: Timely Completion, Budget Adherence, and Quality Standards.

A quantitative research method was used, and data were collected through a structured questionnaire distributed to employees and professionals involved in road projects. A total of 200 valid responses were analyzed using descriptive statistics, correlation, and multiple linear regression analysis.

Key findings from the study are summarized as follows:

- All seven project management practices were positively and significantly related to Timely Completion, Budget Adherence, and Quality Standards.
- Regression results showed that Risk Management, Monitoring and Evaluation, and Planning were the strongest predictors of Timely Completion.
- Cost Management had the most significant influence on Budget Adherence, followed by Planning and Monitoring.
- Monitoring and Evaluation was the most important predictor of Quality Standards, along with Planning and Cost Management.
- All models were statistically significant, and multicollinearity was not a concern.

The findings suggest that a combination of structured planning, risk control, regular performance review, and financial oversight contributes to better road project outcomes in Addis Ababa.

5.2 Conclusions

This study set out to examine the relationship between project management practices and the efficiency of road projects managed by the Addis Ababa Road Authority. The focus was on how practices such as planning, risk management, monitoring and evaluation, resource allocation, cost management, communication, and stakeholder engagement affect project outcomes.

Based on the analysis of data collected from 200 respondents, several key conclusions can be drawn:

1. **Project management practices influence road project efficiency.**

   All seven practices included in the study had a statistically significant and positive effect on Timely Completion, Budget Adherence, and Quality Standards. This suggests that strengthening these practices can improve how projects perform.

2. **Planning, risk management, and monitoring are central to timely project completion.**

   Among the seven predictors, Risk Management, Monitoring and Evaluation, and Planning had the strongest impact on whether road projects were completed on schedule. This indicates that identifying risks, tracking progress, and having a clear plan in place help reduce delays.

3. **Cost management is the main driver of budget adherence.**

   The analysis showed that Cost Management Practices had the highest effect on keeping projects within budget. Planning and monitoring also played a role, but financial control stood out as the most important factor in avoiding cost overruns.

4. **Monitoring is key to achieving quality standards.**

   Of all the practices, **Monitoring and Evaluation** had the strongest link to project quality. Regular review and performance checks appear to help teams meet technical specifications and design requirements.

5. **Other practices still matter.**

   Although their effects were slightly smaller, Communication, Resource Allocation, and Stakeholder Engagement also had significant and positive impacts on all three efficiency indicators. This shows that efficiency relies on a broad range of activities working together.

6. **The findings apply to the local context.**

   The results suggest that the role of project management practices in influencing efficiency is also valid within the Addis Ababa Road Authority. Even though project environments may vary, the core practices studied here are relevant and effective in this setting.

The study concludes that better management practices are linked to better outcomes. Improving how road projects are planned, tracked, managed, and communicated can lead to more timely, cost-effective, and high-quality results.

5.3 Framework for Enhancing Project Management Efficiency

5.3.1 Method for Developing the Framework

The framework was developed using an explanatory design approach, based on both quantitative analysis and conceptual synthesis. Specifically, the method involved:

- Analyzing the strength and significance of correlations between seven project management practices and three key project performance outcomes: Timely Completion, Budget Adherence, and Quality Standards.
- Reviewing standardized beta coefficients from multiple regression models to determine the relative predictive power of each independent variable.
- Ranking the practices based on their average correlation coefficients and practical relevance.
- Synthesizing the findings into an integrated model that highlights the most influential practices and their interrelationships.

This method allowed the researcher to construct a data-driven and evidence-based model specifically tailored to the operational context of AACRA.

5.3.2 Results Supporting the Framework

The empirical results from Chapter Four support the development of the framework as follows:

- The correlation analysis showed that all seven project management dimensions were significantly and positively associated with each of the three performance outcomes ($p < 0.001$).
- Monitoring and Evaluation Practices had the highest average correlation ($r_{avg} = 0.73$), with the strongest individual correlation being with Quality Standards ($r = 0.85$).
- Planning Practices also showed strong correlations with Timely Completion ($r = 0.82$), Budget Adherence ($r = 0.68$), and Quality Standards ($r = 0.70$).
- Regression analysis confirmed that Planning, M&E, Risk Management, and Cost Management had statistically significant and positive effects on project performance (see Section 4.6).
- Stakeholder Engagement and Communication had moderate but statistically significant contributions across all outcomes.

Based on these findings, each of the seven dimensions was validated as a critical factor influencing efficiency in AACRA-managed road projects. Their inclusion in the framework is justified both statistically and practically.

5.3.3 The Framework

This section presents a data-driven framework developed to fulfill Specific Objective 3: "To develop a framework of best practices and recommendations for enhancing project management processes and improving the efficiency of road construction projects within AACRA." The framework is grounded in the actual correlation results presented in Chapter Four, which demonstrated statistically significant and positive relationships between seven project management practices and three key project performance outcomes: Timely Completion, Budget Adherence, and Quality Standards.

The correlation analysis revealed that all seven project management dimensions—Planning Practices, Monitoring and Evaluation, Risk Management, Cost Management, Resource Allocation, Communication, and Stakeholder Engagement—had strong associations with the performance

indicators (all p-values < 0.001). Correlation coefficients ranged between r = 0.44 and r = 0.85, indicating robust and reliable relationships. Planning Practices and Monitoring and Evaluation emerged as the most influential factors, with strong predictive capacity across all three outcomes.

Based on this evidence, the Integrated Project Management Efficiency Framework for Urban Road Projects is proposed. The framework incorporates seven interrelated components, arranged in order of strategic priority and average influence on project efficiency.

 Integrated Project Management Efficiency Framework for Urban Road Projects

1. Strategic Planning Foundation

Planning Practices had the strongest and most consistent correlations across all three dependent variables (r = 0.82 with Timely Completion, r = 0.68 with Budget Adherence, r = 0.70 with Quality Standards). This confirms that structured planning—including accurate scheduling, well-defined scopes, and alignment of resources—provides the foundation for successful project implementation. Planning should be formalized at the earliest stages of project development and regularly updated to respond to evolving needs.

2. Monitoring and Evaluation Loop

Monitoring and Evaluation was the top individual predictor of Quality Standards (r = 0.85), and strongly associated with Timely Completion (r = 0.70) and Budget Adherence (r = 0.64). The framework emphasizes the importance of embedding M&E practices throughout the project lifecycle using KPIs, milestone-based progress checks, and real-time dashboards. This ensures that issues are detected early and corrected promptly.

3. Risk Management Integration

Risk Management showed the strongest correlation with Timely Completion (r = 0.80), and moderate correlations with Budget Adherence (r = 0.50) and Quality Standards (r = 0.56). This highlights the importance of integrating risk identification, response protocols, and mitigation planning into both the planning and execution stages of road projects.

4. Cost Management Systems

Cost Management was the strongest predictor of Budget Adherence (r = 0.84) and also influenced Quality Standards (r = 0.53) and Timely Completion (r = 0.44). The framework recommends

establishing robust financial controls, real-time budget tracking tools, and variance analysis mechanisms to improve fiscal discipline and accountability.

5. Resource Allocation Optimization

With moderate correlations across all outcomes (r = 0.66 with Timely Completion, r = 0.48 with Budget Adherence, and r = 0.54 with Quality Standards), efficient resource allocation supports project delivery by minimizing waste and avoiding labor, material, or equipment shortages. Resource planning tools and flexible deployment strategies should be institutionalized.

6. Stakeholder Engagement Mechanism

Stakeholder Engagement had moderate but significant correlations (r = 0.52 with Timely Completion, r = 0.47 with Budget Adherence, and r = 0.50 with Quality Standards). This component supports inclusive planning, conflict prevention, and social accountability through public consultations, grievance redress mechanisms, and collaborative forums.

7. Communication Infrastructure

Communication Practices showed consistent positive correlations with Timely Completion (r = 0.50), Budget Adherence (r = 0.45), and Quality Standards (r = 0.51). Clear communication structures—including formal reporting channels, coordination meetings, and digital information platforms—promote transparency, alignment, and timely decision-making.

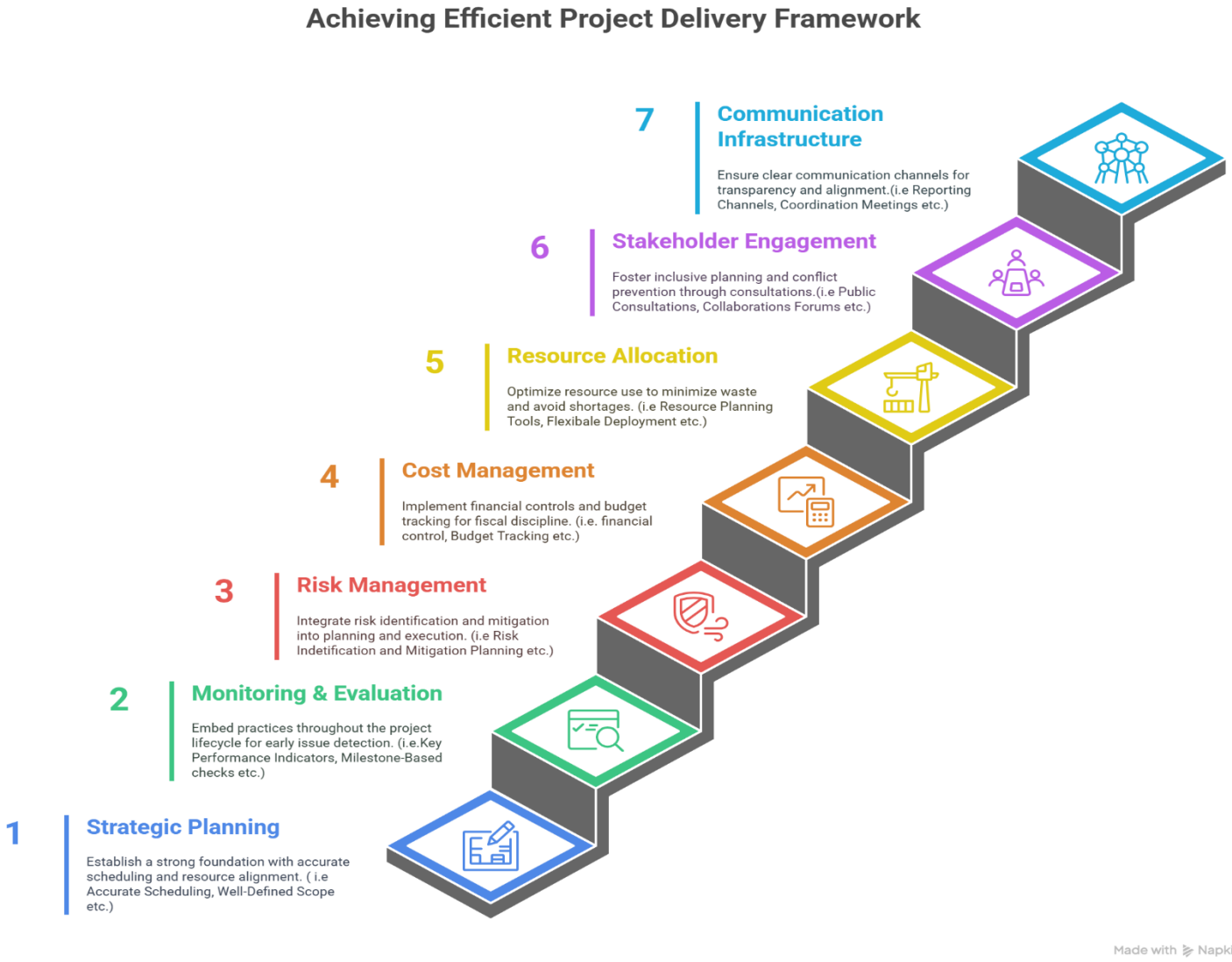

Figure 5.1: Achieving Efficient Project Delivery Framework

These seven interdependent components are illustrated in Figure 5.1, which presents a circular model with "Efficient Project Delivery" at the center, supported by the surrounding pillars. The visual highlights the integrated, systemic nature of effective project management at AACRA.

By institutionalizing this framework, AACRA can strengthen its road construction management systems, reduce delays and cost overruns, and enhance infrastructure quality. The next section provides detailed policy and operational recommendations based on these findings.

5.4 Recommendations

Based on the findings and conclusions of the study, the following recommendations are offered to support improved road project performance within the Addis Ababa Road Authority. Each recommendation aligns with the project management practices that were found to significantly influence Timely Completion, Budget Adherence, and Quality Standards.

1. Strengthen Risk Management Processes

The study found that risk management had a strong influence on timely completion and overall efficiency. It is recommended that:

- Risk assessments be conducted during the early stages of all projects.
- A risk register be maintained and updated regularly.
- Risk mitigation actions be tracked through clear procedures and assigned responsibilities.

2. Integrate Monitoring and Evaluation into Daily Project Operations

Monitoring and Evaluation had the highest effect on quality standards and contributed significantly to cost and schedule control. To strengthen this area:

- Periodic performance reviews should be scheduled and documented.
- Simple monitoring tools and checklists can be used to track activities.
- Reports from monitoring should be used to guide timely adjustments.

3. Improve Planning Procedures and Documentation

Planning was one of the most influential factors across all performance indicators. The Authority should:

- Develop detailed project plans before execution begins.
- Ensure that plans include clear timelines, resource needs, and contingency measures.
- Involve key project staff in the planning process to improve accuracy and ownership.

4. Strengthen Cost Management Controls

Cost management was the most important factor in budget performance. It is recommended to:

- Prepare realistic budgets based on past project data and current market rates.
- Monitor spending against the budget on a regular basis.
- Use cost tracking software or spreadsheets to support financial control.

5. Enhance Communication Practices Across Project Teams

Communication was found to support all three performance outcomes. To improve this:

- Regular team meetings should be held to share updates and address challenges.
- Clear channels for reporting and feedback should be established.
- Documentation of communication (e.g., memos, minutes) should be consistent.

6. Promote Meaningful Stakeholder Engagement

Although its influence was moderate, stakeholder engagement was still significant. It is recommended to:

- Involve stakeholders early, particularly in planning and decision-making.
- Keep stakeholders informed about project progress and delays.
- Address concerns raised by community members, contractors, or government offices in a timely manner.

7. Monitor Resource Allocation and Use

Resource Allocation had a positive effect on efficiency. To improve this:

- Allocate equipment, personnel, and materials based on the project schedule.
- Track how resources are used to identify shortages or misuse.
- Adjust resource distribution as needed to avoid delays or cost increases.

8. Build Capacity Through Training

To ensure these practices are applied effectively, it is also recommended to:

- Provide regular training on project management tools and methods.
- Encourage knowledge-sharing across teams working on different projects.
- Support continuous learning to keep staff updated on good practices.

5.5 Limitations of the Study and Suggestions for Future Research

5.5.1 Limitations of the Study

While this study provides useful insights into how project management practices influence road project efficiency, it is important to acknowledge its limitations:

1. **Focus on a Single Institution**

   The study was limited to the Addis Ababa Road Authority. As a result, the findings may not fully reflect the experiences or practices of other road authorities or infrastructure agencies in different regions or sectors.

2. **Cross-sectional Design**

   The data were collected at one point in time. This limits the ability to observe changes or trends over time in project performance or management behavior.

3. **Reliance on Self-Reported Data**

   Data were gathered through questionnaires completed by staff. This approach may be subject to personal bias, misunderstanding of questions, or differences in interpretation among respondents.

4. **Exclusion of External Factors**

   The study focused only on internal project management practices. External influences such as political decisions, regulatory changes, or weather conditions were not included but may also affect project outcomes.

5.5.2 Suggestions for Future Research

Future studies could address these limitations and expand the scope of research in the following ways:

1. **Include Multiple Institutions or Regions**

   Future research could involve other road authorities, regional infrastructure bureaus, or construction firms. This would allow comparisons across different organizations and environments.

2. **Adopt a Longitudinal Approach**

   Conducting a study over a longer period would help to observe how changes in project management practices affect outcomes across various project phases.

3. **Use Mixed Methods**

   Combining quantitative data with interviews, site visits, or focus group discussions may provide deeper understanding and validate survey findings with real-life project examples.

4. **Consider External Factors**

   Future research could also examine how external elements—such as government policies, funding delays, or local community dynamics—influence project efficiency alongside internal practices.

5. **Study Specific Project Types**

   Researchers may also choose to focus on different types of infrastructure projects (e.g., bridges, drainage systems, urban roads) to explore whether certain practices are more effective in particular contexts.

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ANNEX I

QUESTIONNAIRE

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

OFFICE OF GRADUATE STUDIES

Questionnaire to be Distributed to Employees of Addis Ababa Road Authority

Dear Respondents; This questionnaire is developed for an academic effort planned for the collection of data to conduct a thesis paper on the title **"Assessing the Impact of Project Management Practices on Road Project Efficiency: A case study of Addis Ababa Road Authority."** The success of this survey depends on your participation and truthful responses. I would therefore greatly appreciate your assistance in answering the questionnaire. Please be assured that your response will be kept strictly confidential and only be used for academic purpose. Individual participants will not be identified in the analysis as only aggregated results will be analysed and interpreted.

NB:

- It is not necessary to write your name
- Try to address the entire question given below
- For the closed ended questions use (√) mark for your choice in the given box

Thank you for your cooperation!

AKLILU SHIFERAW

+251 911-38-06-95

Please put right mark(√) in front of your choice box that express yourself

Section 1: Demographic Information

1. **Role in the Project**:
   - Client ☐
   - Contractors ☐
   - Consultants ☐
2. **Years of Experience in Road Construction Projects**:
   - 1 – 3 Years ☐
   - 4 - 6 years ☐
   - 7 - 10 years ☐
   - More than 10 years ☐
3. **Number of Road Projects Managed/Involved in the Last 5 Years**:
   - 1-3 projects ☐
   - 4-6 projects ☐
   - 7-10 projects ☐
   - More than 10 projects ☐

Section 2: Project Management Practices

2.1 Planning Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Project plans are detailed and comprehensive.					
2	Planning tools like Gantt charts and Work Breakdown Structures (WBS) are effectively used.					
3	The project scope is clearly defined and communicated to all stakeholders.					
4	Project plans are regularly reviewed and updated during the project lifecycle.					
5	Planning practices contribute significantly to the timely completion of road projects.					

2.2 Risk Management Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Potential risks are identified and assessed early in the project lifecycle.					
2	Contingency plans are in place for identified risks.					
3	Risk assessments are conducted regularly throughout the project.					
4	Stakeholders are involved in the risk management process.					
5	Risk management practices contribute significantly to the timely completion of road projects.					

2.3 Resource Allocation Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Resources (labor, materials, equipment) are allocated efficiently.					
2	Resource allocation plans are reviewed and adjusted regularly.					
3	Software tools are used to manage resource allocation.					
4	Resource availability is sufficient during critical phases of construction.					
5	Resource allocation practices contribute significantly to the timely completion of road projects.					

2.4 Monitoring and Evaluation (M&E) Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Project progress is regularly tracked against predefined goals and benchmarks.					
2	Performance metrics are used to assess project performance.					
3	Monitoring reports are generated and reviewed regularly.					
4	External evaluators are involved in the monitoring and evaluation process.					
5	M&E practices contribute significantly to the timely completion of road projects.					

2.5 Cost Management Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Project budgets are prepared in detail and regularly updated.					
2	Cost forecasts are reviewed and adjusted regularly.					
3	Cost management software is used to track expenditures.					
4	Project expenditures are kept within the approved budget.					
5	Cost management practices contribute significantly to the timely completion of road projects.					

2.6 Communication Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Communication among project stakeholders is effective.					
2	Regular meetings and progress updates are conducted.					
3	Digital communication tools are used to facilitate project coordination.					
4	Communication plans are reviewed and updated regularly.					
5	Communication practices contribute significantly to the timely completion of road projects.					

2.7 Stakeholder Engagement Practices

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Stakeholders are consulted and involved in key project decisions.					
2	Stakeholder engagement plans are reviewed and updated regularly.					
3	Stakeholder feedback is used to improve project outcomes.					
4	Stakeholder expectations and conflicts are managed effectively.					
5	Stakeholder engagement practices contribute significantly to the timely completion of road projects.					

Section 3: Project Efficiency

3.1 Timely Completion

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Road projects are completed on schedule.					
2	Delays in road projects are primarily due to poor planning.					
3	Delays in road projects are primarily due to insufficient resources.					
4	Delays in road projects are primarily due to unforeseen risks.					
5	Delays in road projects are primarily due to stakeholder conflicts.					

3.2 Budget Adherence

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Road projects stay within the approved budget.					
2	Cost overruns in road projects are primarily due to poor cost management.					
3	Cost overruns in road projects are primarily due to resource misallocation.					
4	Cost overruns in road projects are primarily due to unforeseen risks.					
5	Cost overruns in road projects are primarily due to stakeholder conflicts.					

3.3 Quality Standards

Question No.	Statement	Parameters				
		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	Completed road projects meet the required technical specifications.					
2	The quality of completed road projects is excellent.					
3	Quality standards are reviewed and updated regularly.					
4	Quality control tools are used to ensure project standards.					
5	Challenges in maintaining quality standards are primarily due to external factors.					

Thank you for your cooperation!