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DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

INVESTIGATING THE NEXUS BETWEEN PUBLIC PROCUREMENT MANAGEMENT
MATURITY AND SUSTAINABLE PERFORMANCE OF ROAD INFRASTRUCTURE
DEVELOPMENT PROJECTS: AN EMPIRICAL STUDY IN ADAMA CITY

BY
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Investigating the Nexus Between Public Procurement Management Maturity and Sustainable Performance of Road Infrastructure Development Projects: An Empirical Study in Adama City

A Thesis Submitted to Addis College The School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Science in Construction Technology and Management

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DECLARATION

I hereby declare that this Master Thesis “**Investigating the Nexus Between Public Procurement Management Maturity and Sustainable Performance of Road Infrastructure Development Projects: An Empirical Study in Adama City**” 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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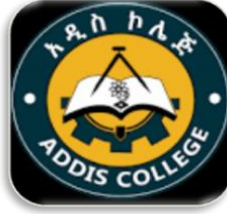
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ABSTRACT

This study investigates the relationship between procurement management maturity and the performance of road infrastructure development projects in Adama, Ethiopia. Given the critical role of road infrastructure in economic growth, social welfare, and environmental sustainability, understanding the factors influencing project success is imperative. While procurement management is recognized as a key determinant, existing research provides inconclusive findings. This study aims to bridge this knowledge gap by assessing the level of procurement maturity in the public sector, evaluating project sustainability, and examining the correlation between these two variables. A mixed-methods approach, employing surveys and interviews with industry professionals, was used to collect data. Findings reveal critical areas for improvement, including project design, maintenance, and user safety. The study establishes a positive correlation between procurement management maturity and project sustainability. Enhancing procurement practices through clear vision, defined procedures, transparency, and stakeholder collaboration is recommended to improve project outcomes. The findings contribute to the broader understanding of sustainable infrastructure development and inform policymaking in the sector. Further research is warranted to deepen the knowledge on the intricate relationship between procurement management and infrastructure sustainability.

Key words: Procurement Management Maturity; Road Infrastructure Development; Sustainable Performance; Public Sector; Mixed-Methods Research

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LIST OF ABBREVIATIONS AND ACRONYMS

BIM	Building Information Modelling
CBA	Cost-Benefit Analysis
CUTs	Centre for Trade Policy and Development
DBFM	Design-Build-Finance-Transfer
EU	European Union
GEP	Global Enterprise Procurement
ICT	Information and Communications Technology
KeNHA	Kenyan National Highway Authority
KPI	Key Performance Indicators
LCSA	Life-Cycle Sustainability Assessment
M&E	Monitoring and Evaluation
NIGP	National Institute of Government Purchasing
OCED	Organization for Economic Co-operation and Development
OCED-DAC	OCED-Development Assistance Committee
PMI	Project Procurement Management
PPI	Public Procurement of Innovation
PPP	Public-Private Partnership
RBV	Resource-Based View
RII	Relative Importance index
RPA	Robot Process Automation
SMART	Specific, Measurable, Achievable, Relevant, and Time-Bound
SMEs	Small and Micro Enterprises
SRM	Supply Relationship Management
UNEP	United Nations Environment Programme

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Road infrastructure development projects are essential for economic growth, social welfare, and environmental sustainability (Ng et al., 2019). In developing countries, road infrastructure development projects play a significant role in connecting rural areas to urban centers, facilitating trade and commerce, and improving access to education, healthcare, and other essential services (Quium, 2019). However, these projects often face challenges such as cost overruns, delays, quality issues, and corruption. These challenges can result from various factors, such as poor planning, design, and execution; inadequate funding and financing; lack of coordination and collaboration among stakeholders; and weak governance and regulation. One of the key factors that influence the performance of road infrastructure projects is the procurement management process, which involves the selection of the most suitable contractor, contract type, and procurement strategy for each project (Debela, 2022). The procurement management process can affect the quality, cost, time, and risk of the project, as well as its social and environmental impacts (Hald et al., 2021). Therefore, it is crucial to adopt a strategic and holistic approach to procurement management that aligns with the project objectives and the stakeholder expectations.

The concept of procurement management maturity refers to the degree to which an organization has developed and implemented effective and efficient procurement practices, policies, and systems. A higher level of procurement management maturity implies a better ability to deliver road infrastructure projects that meet the expectations of the stakeholders and the society. Several studies have explored the relationship between procurement management maturity and the performance of road infrastructure projects, using different frameworks, models, and indicators (OECD, 2021; Bridge et al., 2020; Dagba & Dagba, 2023; Zulu, 2019; Ibrahim, 2022; Nsanzimana & Mulyungi, 2020). These studies have identified various dimensions and criteria for assessing and improving the procurement management maturity, such as the procurement strategy, organization, and governance; the procurement process and methods; the procurement skills and capabilities; the procurement technology and tools; and the procurement performance and outcomes. By applying these frameworks and models, organizations can benchmark their current

procurement maturity level, identify their strengths and weaknesses, and develop action plans for enhancing their procurement capabilities and results.

The literature on the relationship between procurement management maturity and road infrastructure performance is inconclusive and lacks a comprehensive understanding (Ford, 2024). Most studies use a few indicators to measure procurement maturity, such as strategic procurement, innovative procurement methods, and procurement skills, which may not capture the full spectrum of procurement management practices and capabilities affecting project performance. Road infrastructure performance is measured using indicators such as completion time, actual cost, quality standards, and environmental impacts, which may not reflect the broader value and benefits of road infrastructure projects for society. Additionally, most studies do not consider the causal mechanisms and moderating factors that link procurement management maturity and road infrastructure performance, such as contractor selection, contract design, risk management, dispute resolution, project characteristics, market conditions, and institutional environment (Wang et al., 2023).

Therefore, this study aims to fill these gaps and provide a comprehensive and systematic analysis of the relationship between procurement management maturity and road infrastructure performance. In conclusion, the proposed study aims to explore the nexus between procurement management maturity and road infrastructure development projects in Adama, Ethiopia. The background of the study highlights the poor performance of procurement management practices in developing countries. It also considers the main findings of related and recent studies, as well as other elements of the background, such as the current state of road infrastructure, the importance of roads for economic development, and the potential impact of improving procurement management on project success (Nawir et al., 2023; Mahmood et al., 2024). The study would contribute to the existing literature on procurement management and provide insights for policymakers and practitioners to improve the performance of road infrastructure projects in Ethiopia.

1.2 Statement of the Problem

Public procurement is a crucial government function that involves acquiring goods, services, and works from external sources. Public procurement management involves planning, implementing, monitoring, and evaluating these activities to ensure efficiency, effectiveness, transparency, and accountability (Patrucco et al., 2016). Public procurement management maturity refers to an organization's ability to develop and implement necessary policies, procedures, systems, and skills (Casady et al., 2020). Road infrastructure development projects are essential for economic and social development, facilitating movement of people, goods, and services, and enhancing connectivity (Srinivasu and Rao, 2013). These complex and costly projects require high coordination among stakeholders, including government, contractors, consultants, financiers, beneficiaries, and communities. The quality and sustainability of these projects depend on effective public procurement management practices (Oruezabala and Rico, 2012).

However, public procurement management practices in Ethiopia have been characterized by poor performance (Awoke and Singh, 2016), resulting in delays, cost overruns, quality defects, corruption and wastage of public resources. According to a study by Tesfahun (2011), the main challenges faced by public procurement in Ethiopia include lack of transparency and accountability, weak institutional capacity, inadequate legal framework, low level of competition and participation, and insufficient monitoring and evaluation. Another study by OECD found that Ethiopia's public procurement system scored below the average of the OECD-DAC countries in terms of efficiency, effectiveness, transparency, integrity and accountability (MAPS, 2021).

The existing literature on public procurement management and road infrastructure development projects in Ethiopia has several gaps that need to be addressed. First, there is no procurement management maturity assessment framework based on internationally recognized standards and best practices to identify areas for improvement in the public procurement management system in Ethiopia. Such a framework would enable the government to benchmark its performance against other countries and to design and implement appropriate reforms and improvements.

Second, there is a lack of empirical study to examine the impact of public procurement management maturity assessment criteria on the sustainable performance of road infrastructure

development projects in Ethiopia. Most of the existing studies focused on road construction projects, which are only one component of road infrastructure development projects. Moreover, the existing studies did not use a comprehensive and consistent set of criteria to measure the maturity level of public procurement management and its influence on the project outcomes. Third, there is a lack of systematic prioritization of the strategies for improving public procurement management practices based on the gaps between the current practices and the desired maturity level and specific areas for improvement based on the impact on project outcomes. The existing studies provided general recommendations and best practices, but did not consider the context and the feasibility of implementing them in Ethiopia.

Therefore, this study aims to investigate the relationship between the level of procurement management maturity and the effectiveness and sustainability of road infrastructure development projects in Adama, Ethiopia, utilizing an empirical approach.

1.3 Objective of the Study

1.3.1 General objective of the study

The general objective of the study is to explore the nexus between the level of public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City.

1.3.2 Specific objectives of the study

The specific objectives of this study are:

- To assess the level of public procurement management maturity of the public sector client in delivering road infrastructure development projects.
- To evaluate the sustainable performance of road infrastructure development projects.
- To examine the correlational relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects.
- To prioritize the management strategies that potentially improve the maturity of public procurement management.

1.4 Research Questions

The research questions of the study are:

- What is the level of public procurement management maturity of the public sector client delivering road infrastructure development projects in Adama City?
- How do road infrastructure development projects in Adama City perform in terms of environmental, social, and economic sustainability?
- Is there a correlation or causal relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City?
- What management strategies have the potential to most effectively improve the public sector client's public procurement management maturity in delivering road infrastructure development projects in Adama City?

1.5 Significance of the study

This study aims to explore the correlation between procurement management maturity and the effectiveness and sustainability of road infrastructure development projects in Adama, Ethiopia. It aims to assess the public sector client's procurement management maturity, examine the impact of procurement management practices on project effectiveness and sustainability, and prioritize strategies for improving procurement management maturity. The study will contribute to existing literature by providing empirical evidence on factors influencing quality, efficiency, and sustainability of road infrastructure projects in Adama, Ethiopia. It will also propose a framework and tool for assessing and improving procurement management maturity, based on best practices and lessons learned from other countries.

This study aims to benefit various stakeholders, including public sector clients, contractors, policy makers, researchers, and the general public. Public sector clients, responsible for planning, procuring, and managing road infrastructure projects, will gain a better understanding of their procurement management maturity and areas for improvement. The study will develop a framework and tool to assess and improve procurement management maturity, enabling more effective strategies and methods. Contractors involved in the design, construction, and

maintenance of road infrastructure projects will gain clarity on procurement requirements and performance criteria, reducing risks and uncertainties. Policy makers, responsible for setting vision and priorities for road infrastructure development, will gain more evidence on the impact of procurement management maturity on project effectiveness and sustainability.

The study will provide insights and recommendations on aligning procurement policies with national objectives, such as sustainability, quality, and inclusiveness. Researchers interested in procurement management and road infrastructure development will gain access to new data and analysis on the relationship between procurement management maturity and project performance in Adama, Ethiopia. The study will also develop a framework and tool for assessing and improving procurement management maturity in other contexts and sectors. The general public, the ultimate beneficiaries of road infrastructure projects, will benefit from more reliable, safe, and accessible infrastructure that meets their needs and preferences, enhancing their quality of life.

This study may also help future studies in the field, by providing new insights, methods, or recommendations on how to improve the procurement management maturity and the performance of road infrastructure projects. It may also inspire further research on the factors and mechanisms that influence the effectiveness and sustainability of road infrastructure development in different contexts and sectors.

1.6 Scope of the study

This study delved into the intricate relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City, Ethiopia. Employing a mixed-methods research design, the study collected both quantitative and qualitative data from January to June 2024.

The research was conducted at Adama city government: consultants, contractors engaged in Adama road infrastructure development projects, Adama city construction authority, municipality (client) . By understanding the historical relationship between public procurement management maturity and sustainable performance of road infrastructure development projects, stakeholders can develop and implement strategies to achieve improved project outcomes that are not only functional but also environmentally and socially responsible. The study's methodology and

findings may also be applicable to similar contexts with comparable public procurement practices and road infrastructure development approaches.

1.7 Limitations of the Study

This study acknowledges several limitations that influence the generalizability and conclusiveness of its findings. The research focused on professionals involved in road infrastructure development projects within Adama City, Ethiopia. While the sample size was determined using a recognized statistical formula and stratified random sampling ensured representation of various stakeholder groups, the findings may not be universally applicable to other contexts. Public procurement practices, infrastructure development approaches, and even sustainability priorities can vary significantly depending on geographic location, economic development level, and political structures. Further research in different contexts would be necessary to establish the wider applicability of the observed relationships.

The data collection period spanned only six months, from January to June 2024. This timeframe may not adequately capture potential seasonal variations or long-term trends in public procurement practices or project sustainability outcomes. A longitudinal study design following projects over a longer period could provide more nuanced insights.

The study relied heavily on self-reported data collected through questionnaires and interviews. Participants' perceptions of public procurement maturity and project sustainability may be subjective and prone to biases such as memory lapses or social desirability. Ideally, the study could have been complemented with objective data sources such as official procurement records or independent assessments of project sustainability.

The research primarily investigated perceptions of the relationship between public procurement practices and project sustainability. While valuable, establishing a causal relationship would necessitate a more rigorous experimental design that could isolate the specific impact of procurement practices on various sustainability outcomes.

These limitations highlight the need for further research to broaden the generalizability of the findings and strengthen the understanding of the complex relationship between public procurement management and sustainable infrastructure development.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review chapter provides a comprehensive overview of the relationship between procurement management maturity and the effectiveness and sustainability of road infrastructure development projects. Procurement management involves planning, selecting, contracting, and monitoring the delivery of goods and services for a project (PMI, 2017). The level of procurement management maturity reflects an organization's ability to apply best practices and standards in its projects (Kerzner, 2017). The effectiveness and sustainability of road infrastructure development projects refer to the extent to which the projects achieve their intended outcomes and benefits, and maintain their functionality and value over time (World Bank, 2019).

The chapter is organized into four sections: defining the topic, providing background and context, addressing the main research question or problem, presenting findings and analysis, synthesizing key themes, gaps, and controversies, and contributing to the research objectives and thesis. The main research question is how the level of procurement management maturity of public sector clients affects the effectiveness and sustainability of road infrastructure development projects.

The research objectives include assessing the level of procurement management maturity of public sector clients in delivering road infrastructure development projects using a validated maturity assessment model and tool, examining the impact of procurement management practices on the effectiveness and sustainability of road infrastructure development projects using a mixed-methods approach, and systematically prioritizing management strategies for improving procurement management maturity using a ranking technique.

The literature review contributes to the research objectives by providing a theoretical and empirical foundation for the research topic, identifying key factors, dimensions, indicators, and measures of procurement management maturity, effectiveness, and sustainability, highlighting best practices, challenges, and opportunities for improving procurement management maturity, and developing a conceptual framework and research model for data collection, analysis, and interpretation.

2.2 Public Procurement and Its Management

Public procurement refers to the process by which government agencies and public sector institutions acquire goods, services, and works from private sector companies. Effective management of public procurement is crucial for ensuring transparency, efficiency, and value for money in the use of public resources. This literature review explores the theoretical foundations and key themes in the field of public procurement and its management.

Public procurement is grounded in several theoretical frameworks, including principal-agent theory, transaction cost economics, and institutional theory. Principal-agent theory addresses the relationship between the government (principal) and suppliers (agents), focusing on issues of information asymmetry and contract enforcement (Patrucco et al., 2017). Transaction cost economics examines the costs associated with procurement transactions, emphasizing the importance of minimizing these costs to achieve efficiency (Williamson, 1985). Institutional theory highlights the role of formal and informal institutions in shaping procurement practices and outcomes (North, 1990).

2.3 Public Procurement Principles and Objectives

Transparency and accountability are fundamental principles in public procurement. Transparent procurement processes help prevent corruption and ensure that public funds are used effectively. Studies have shown that clear procurement regulations and open bidding processes enhance accountability and trust in public institutions (Thai & Piga, 2007).

Efficiency in public procurement involves achieving the best possible outcomes with the least amount of resources. Value for money is a key objective, requiring procurement managers to balance cost, quality, and timeliness. Research indicates that strategic procurement planning and effective contract management are critical for achieving efficiency and value for money (Harink, 1999).

Innovation in public procurement refers to the adoption of new technologies and practices to improve procurement outcomes. Public procurement can drive innovation by creating demand for innovative products and services. A systematic literature review by Kundu et al. (2020) highlights the growing interest in using public procurement as a tool for fostering innovation, particularly in OECD and EU countries.

Sustainable procurement practices aim to minimize the environmental impact of procurement activities and promote social responsibility. This includes considering the lifecycle costs of products and services, as well as their social and environmental implications. Research by Brammer and Walker (2011) emphasizes the importance of integrating sustainability criteria into public procurement processes.

Despite the theoretical advancements and practical improvements, public procurement faces several challenges. These include bureaucratic inefficiencies, lack of capacity and expertise, and resistance to change. Addressing these challenges requires continuous capacity building, policy reforms, and the adoption of best practices from both the public and private sectors (Patrucco et al., 2017).

Public procurement and its management are critical for ensuring the effective use of public resources. Theoretical frameworks such as principal-agent theory, transaction cost economics, and institutional theory provide valuable insights into the complexities of procurement processes. Key themes such as transparency, efficiency, innovation, and sustainability highlight the multifaceted nature of public procurement. Ongoing research and policy efforts are essential for addressing the challenges and enhancing the effectiveness of public procurement systems.

2.4 Procurement of Public Infrastructure Projects

The procurement of public infrastructure projects, particularly road infrastructure, is a complex process that involves multiple stakeholders, significant financial investments, and long-term planning. Effective procurement management is essential for ensuring that these projects are completed on time, within budget, and to the required quality standards. This literature review explores the theoretical underpinnings and key themes related to the procurement of public infrastructure projects, with a focus on the nexus between public procurement management maturity and sustainable performance.

The procurement of public infrastructure projects is informed by several theoretical frameworks, including public choice theory, Resource-Based View (RBV), and stakeholder theory. Public choice theory examines the decision-making processes of government officials and the impact of these decisions on public resource allocation (Mueller, 2003). The resource-based view emphasizes the strategic importance of organizational resources and capabilities in achieving

competitive advantage and project success (Barney, 1991). Stakeholder theory highlights the importance of managing relationships with various stakeholders, including contractors, suppliers, and the community, to ensure project success (Freeman, 1984).

Procurement management maturity refers to the extent to which procurement processes and practices are standardized, optimized, and continuously improved. Higher levels of procurement maturity are associated with better project outcomes, including cost savings, timely delivery, and enhanced quality (Patrucco et al., 2017). Research indicates that mature procurement practices, such as strategic sourcing and supplier relationship management, contribute to the successful delivery of infrastructure projects (Walker & Rowlinson, 2008).

Sustainable performance in the context of public infrastructure projects involves achieving economic, environmental, and social objectives. This includes minimizing the environmental impact of construction activities, promoting social inclusion, and ensuring long-term economic viability. Studies have shown that integrating sustainability criteria into procurement processes can lead to improved project outcomes and greater public value (Brammer & Walker, 2011).

Effective risk management is crucial for the successful procurement of public infrastructure projects. This involves identifying, assessing, and mitigating risks throughout the project lifecycle. Research highlights the importance of adopting a proactive approach to risk management, including the use of risk-sharing mechanisms and contingency planning (Love et al., 2011). Public-Private Partnerships (PPPs) are often used as a risk management strategy, allowing for the sharing of risks between the public and private sectors (Regan et al., 2015).

Innovation and technology adoption play a significant role in enhancing the efficiency and effectiveness of public infrastructure procurement. The use of advanced technologies, such as Building Information Modeling (BIM) and e-procurement systems, can streamline procurement processes, improve project coordination, and reduce costs (Kumaraswamy et al., 2004). Research indicates that fostering a culture of innovation within procurement organizations can lead to better project outcomes and increased value for money (Kundu et al., 2020).

Despite the theoretical advancements and practical improvements, the procurement of public infrastructure projects faces several challenges. These include bureaucratic inefficiencies, lack of capacity and expertise, and resistance to change. Addressing these challenges requires continuous

capacity building, policy reforms, and the adoption of best practices from both the public and private sectors (Patrucco et al., 2017).

The procurement of public infrastructure projects is a critical area of public administration that requires effective management to ensure successful project outcomes. Theoretical frameworks such as public choice theory, resource-based view, and stakeholder theory provide valuable insights into the complexities of procurement processes. Key themes such as procurement management maturity, sustainable performance, risk management, and innovation highlight the multifaceted nature of public infrastructure procurement. Ongoing research and policy efforts are essential for addressing the challenges and enhancing the effectiveness of procurement systems.

2.5 Public Procurement Management Maturity Areas

Public procurement management is crucial for the successful delivery of road infrastructure development projects. This literature review explores the concept of public procurement management maturity and its influence on sustainable project outcomes. Four key maturity areas are explored: Strategic Alignment & Performance, Organizational Structure & Capability, Process Efficiency & Innovation, and Ethics & Sustainability. The review aims to understand how public procurement management maturity contributes to the sustainable performance of road infrastructure development projects in Adama City. The research reveals the various factors that influence procurement maturity and ultimately, project success. By examining these key areas, the review sheds light on the factors that influence procurement maturity and ultimately, project success.

2.5.1 Strategic Alignment & Performance

Public procurement management maturity is a critical factor in the successful delivery of infrastructure projects. This empirical literature review focuses on the strategic alignment and performance aspects of procurement management maturity, particularly in the context of road infrastructure development projects. The review aims to explore how strategic alignment and performance impact the sustainable performance of these projects.

Strategic alignment in public procurement refers to the extent to which procurement strategies are aligned with organizational objectives and specific project goals. Effective strategic alignment ensures that procurement activities support the broader goals of the organization and contribute to

the successful delivery of infrastructure projects. Research by Patrucco et al. (2017) highlights the importance of aligning procurement strategies with organizational objectives to enhance project outcomes. The study found that organizations with well-aligned procurement strategies tend to achieve better project performance, including cost savings and timely delivery. Similarly, Walker and Rowlinson (2008) emphasize the need for procurement plans to be integrated with other strategic plans, considering factors such as risk, quality, and budget.

Performance measurement is a key component of procurement management maturity. It involves the use of Key Performance Indicators (KPIs) to monitor and evaluate procurement activities. Effective performance measurement helps organizations identify areas for improvement and ensure that procurement processes are efficient and effective. A study by Harland et al. (2007) found that organizations that regularly monitor and evaluate their procurement performance using KPIs are more likely to achieve their project goals. The study also highlights the importance of benchmarking procurement performance against industry standards and best practices to drive continuous improvement.

The integration of procurement plans with other strategic plans is crucial for ensuring that procurement activities are aligned with the overall goals of the organization. This includes developing comprehensive procurement plans that outline objectives, timelines, budgets, and risk strategies. Research by Thai and Piga (2007) suggests that integrated procurement planning leads to better project outcomes by ensuring that all aspects of the project are considered and addressed. The study found that organizations with integrated procurement plans are better able to manage risks and achieve their project goals.

The ability of procurement strategies to respond to changes in organizational objectives and market conditions is another important aspect of procurement management maturity. Organizations need to be flexible and adaptable to ensure that their procurement strategies remain relevant and effective. A study by Brammer and Walker (2011) found that organizations that regularly evaluate and adjust their procurement strategies in response to changes are more likely to achieve sustainable performance. The study highlights the importance of continuous monitoring and evaluation to ensure that procurement strategies remain aligned with organizational goals.

Strategic procurement decision-making involves making informed decisions that align with the long-term goals of the organization. This includes assessing the potential impact of procurement

decisions on the overall performance of the organization and its projects. Research by Kundu et al. (2020) emphasizes the importance of strategic decision-making in public procurement. The study found that organizations that prioritize strategic decision-making are more likely to achieve their project goals and improve their overall performance.

The empirical literature on public procurement management maturity highlights the importance of strategic alignment and performance in achieving sustainable project outcomes. Effective strategic alignment ensures that procurement activities support the broader goals of the organization, while performance measurement helps organizations identify areas for improvement. The integration of procurement plans, responsiveness to changes, and strategic decision-making are also critical factors in achieving procurement management maturity. Ongoing research and policy efforts are essential for enhancing the effectiveness of procurement systems and ensuring the successful delivery of infrastructure projects.

2.5.2 Organizational Structure & Capability

The organizational structure and capability of the procurement department play a crucial role in the successful delivery of public infrastructure projects. This empirical literature review focuses on how the structure, roles, and capabilities within the procurement department impact the maturity of public procurement management and, consequently, the sustainable performance of road infrastructure development projects.

The structure of the procurement department, including the roles and responsibilities of its members, significantly influences procurement outcomes. A well-defined structure with a dedicated team for specific projects, such as road infrastructure, ensures that procurement activities are focused and aligned with project goals. Research by Patrucco et al. (2017) indicates that a clear organizational structure within the procurement department enhances efficiency and accountability, leading to better project performance.

Clearly defined and communicated roles and responsibilities within the procurement department are essential for effective procurement management. Leadership support is critical in this regard, as it ensures that procurement staff have the necessary authority and resources to carry out their tasks. A study by Harland et al. (2007) found that organizations with well-defined roles and strong leadership support tend to achieve higher levels of procurement maturity and project success.

Succession planning and talent retention are vital for maintaining a high level of procurement capability. Organizations that invest in developing their procurement staff and creating a culture of continuous learning and improvement are better positioned to achieve sustainable project outcomes. Research by Thai and Piga (2007) highlights the importance of succession planning and talent retention in building a capable and resilient procurement workforce.

The integration of the procurement department with other organizational departments is crucial for achieving organizational synergy. Effective integration ensures that procurement activities are aligned with the overall strategic goals of the organization. A study by Walker and Rowlinson (2008) found that organizations with integrated procurement departments are better able to manage risks and achieve their project objectives.

The effectiveness of the decision-making hierarchy within the procurement department is another important factor in procurement management maturity. A clear and efficient decision-making process ensures that procurement decisions are made in a timely and informed manner. Research by Brammer and Walker (2011) suggests that organizations with effective decision-making hierarchies are more likely to achieve their procurement goals and improve project performance.

The competence and skills of procurement staff are critical for the successful delivery of infrastructure projects. Continuous training and development programs help ensure that procurement staff have the necessary skills and knowledge to manage complex procurement activities. A study by Kundu et al. (2020) emphasizes the importance of aligning staff competencies with the strategic needs of procurement projects to achieve better project outcomes.

The empirical literature on public procurement management maturity highlights the importance of organizational structure and capability in achieving sustainable project outcomes. A well-defined structure, clear roles and responsibilities, effective succession planning, and integration with other departments are critical factors in enhancing procurement management maturity. Additionally, the competence and skills of procurement staff, supported by continuous training and development, play a significant role in achieving procurement success. Ongoing research and policy efforts are essential for improving the organizational structure and capability of procurement departments and ensuring the successful delivery of infrastructure projects.

2.5.3 Process Efficiency & Innovation

Process efficiency and innovation are critical components of public procurement management maturity. These elements play a significant role in enhancing the effectiveness and sustainability of road infrastructure development projects. This empirical literature review examines how process efficiency and innovation impact the maturity of public procurement management and the sustainable performance of such projects.

Efficiency in procurement processes involves the utilization of standardized procedures and modern Internet ICT tools to streamline activities and reduce costs. Research by Patrucco et al. (2017) highlights that organizations with efficient procurement processes tend to achieve better project outcomes, including cost savings and timely delivery. The use of ICT tools, such as e-procurement systems, has been shown to enhance transparency and efficiency in procurement activities (Walker & Rowlinson, 2008).

Innovation in procurement involves the adoption of new methods, tools, and techniques to improve procurement outcomes. Studies have shown that innovative procurement practices can lead to significant improvements in project performance. For instance, Kundu et al. (2020) found that Public Procurement of Innovation (PPI) can drive technological advancements and improve the quality of infrastructure projects. Encouraging innovation within the procurement department is essential for achieving higher levels of procurement maturity.

Defined processes for supplier selection, evaluation, and relationship management are crucial for ensuring that procurement activities are effective and aligned with project goals. Research by Harland et al. (2007) indicates that organizations with well-defined supplier management processes are better able to manage risks and achieve their project objectives. Effective supplier relationship management also contributes to improved project performance and sustainability.

The procurement cycle time, or the time taken to complete procurement activities, has a significant impact on project timelines. Reducing procurement cycle time can lead to faster project delivery and cost savings. A study by Thai and Piga (2007) found that organizations that focus on reducing procurement cycle time tend to achieve better project outcomes. Assessing and optimizing the procurement cycle time is essential for enhancing process efficiency.

The procurement department's approach to innovation plays a critical role in determining its overall efficiency and effectiveness. Organizations that foster a culture of innovation and encourage the adoption of new technologies and practices are more likely to achieve higher levels of procurement maturity. Research by Brammer and Walker (2011) suggests that innovative procurement practices can lead to significant improvements in project performance and sustainability.

The use of performance metrics to track efficiency, cost savings, and project delivery timelines is essential for monitoring and improving procurement processes. Performance metrics provide valuable insights into the effectiveness of procurement activities and help identify areas for improvement. A study by Kundu et al. (2020) emphasizes the importance of using performance metrics to drive continuous improvement in procurement processes.

The empirical literature on public procurement management maturity underscores the importance of process efficiency and innovation in achieving sustainable project outcomes. Efficient procurement processes, innovative practices, well-defined supplier management processes, optimized procurement cycle times, and the use of performance metrics are critical factors in enhancing procurement management maturity. Ongoing research and policy efforts are essential for improving process efficiency and fostering innovation within procurement departments to ensure the successful delivery of infrastructure projects.

2.5.4 Ethics & Sustainability

Ethics and sustainability are fundamental components of public procurement management maturity. These elements ensure that procurement activities are conducted with integrity, transparency, and a focus on long-term environmental and social impacts. This empirical literature review examines how ethics and sustainability influence the maturity of public procurement management and the sustainable performance of road infrastructure development projects.

Incorporating sustainability, social responsibility, and environmental factors into procurement decisions is essential for achieving sustainable project outcomes. Research by Brammer and Walker (2011) highlights that sustainable procurement practices can lead to significant environmental and social benefits. The study found that organizations that prioritize sustainability

in their procurement processes are more likely to achieve long-term project success and public value.

Ethical practices, including integrity, transparency, accountability, and fairness, are crucial for maintaining public trust and ensuring the effective use of public resources. A study by Patrucco et al. (2017) emphasizes the importance of ethical behavior in public procurement, noting that ethical practices help prevent corruption and enhance the overall effectiveness of procurement activities. The study also highlights the role of transparency in promoting accountability and trust in public institutions.

The effectiveness of procurement policies in promoting ethical behavior and preventing corruption is a key area of focus in public procurement management maturity. Research by Thai and Piga (2007) suggests that well-designed procurement policies can significantly reduce the risk of corruption and unethical behavior. The study found that organizations with robust procurement policies are better able to ensure compliance with ethical standards and achieve their procurement objectives.

Assessing the impact of procurement activities on local communities and the environment is essential for ensuring that procurement practices contribute to sustainable development. A study by Harland et al. (2007) found that organizations that consider the social and environmental impacts of their procurement activities are more likely to achieve positive outcomes for local communities and the environment. The study emphasizes the importance of integrating social and environmental criteria into procurement decisions to promote sustainability.

The empirical literature on public procurement management maturity underscores the importance of ethics and sustainability in achieving sustainable project outcomes. Incorporating sustainability, social responsibility, and environmental factors into procurement decisions, promoting ethical practices, ensuring the effectiveness of procurement policies, and assessing the impact of procurement activities on local communities and the environment are critical factors in enhancing procurement management maturity. Ongoing research and policy efforts are essential for improving the ethical and sustainable practices within procurement departments to ensure the successful delivery of infrastructure projects.

Category	Procurement Management Maturity Assessment Criteria	Source
Strategic Alignment and Planning	Alignment of procurement strategy with organizational objectives and road infrastructure development goals.	Esperilla-Niño-de-Guzmán et al. (2024); Arshad et al. (2021); Lædre et al. (2006).
	Integration of procurement plans with other strategic plans, considering risk, quality, and budget.	
	Development of comprehensive and individual project procurement plans, outlining objectives, timelines, budget, and risk strategies.	
	Evaluation of the procurement strategy's responsiveness to changes in organizational objectives and market conditions.	
	Assessment of the strategic procurement decision-making process and its alignment with long-term infrastructure goals.	
Performance Monitoring and Improvement	Monitoring and evaluation of procurement performance using key performance indicators (KPIs).	Patrucco et al. (2017); Harland et al. (2007); Kundu et al. (2020).
	Regular reviews, audits, and feedback mechanisms for continuous improvement.	
	Use of performance metrics to track efficiency, cost savings, and project delivery timelines.	
	Analysis of the procurement system's ability to adapt to new performance metrics and KPIs.	
	Benchmarking procurement performance against industry standards and best practices.	
Organizational Structure and Support	Structure and roles within the procurement department, including a dedicated team for managing road infrastructure projects.	Patrucco et al. (2017); Thai and Piga (2007); Brammer and Walker (2011).
	Clearly defined and communicated roles and responsibilities, with support from leadership for procurement initiatives.	
	Succession planning, talent retention, and a culture of continuous learning and improvement.	
	Examination of the procurement department's integration with other departments to achieve organizational synergy.	
	Evaluation of the effectiveness of the decision-making hierarchy within the procurement function.	
Procurement Processes and Efficiency	Efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools.	Walker & Rowlinson (2008); Thai and Piga (2007).
	Encouragement and adoption of innovative procurement methods, tools, and techniques.	
	Defined processes for supplier selection, evaluation, and relationship management.	
	Assessment of the procurement cycle time and its impact on project timelines.	

	Review of the procurement department's approach to innovation and its impact on process efficiency.	
Skills Development and Workforce Competence	Competence and skills of procurement staff, with provision for continuous training and development.	Kundu et al. (2020); Brammer and Walker (2011)
	A workforce with the necessary expertise in procurement management.	
	Analysis of the alignment between staff competencies and the strategic needs of procurement projects.	
	Evaluation of the effectiveness of professional development programs in keeping pace with industry changes.	
Ethics, Sustainability, and Social Responsibility	Consideration of sustainability, social responsibility, and environmental factors in procurement decisions.	Harland et al. (2007); Thai and Piga (2007); Patrucco et al. (2017).
	Ethical practices, integrity, transparency, accountability, and fairness in procurement.	
	Review of the procurement policies' effectiveness in promoting ethical behavior and preventing corruption.	
	Assessment of the impact of procurement activities on local communities and the environment.	

2.6 Performance of Road Infrastructure Development Projects

This literature review explores the concept of sustainable performance in road infrastructure development projects. Sustainable performance encompasses the project's economic, social, and environmental impacts, ensuring its long-term viability and positive contributions to society. Five key dimensions of sustainable performance are explored: Economic Sustainability, which focuses on the project's financial viability, Social Sustainability, which examines the social impacts, Environmental Sustainability, which emphasizes minimizing environmental damage, Technical and Operational Sustainability, which investigates the technical aspects of the project, and Performance and Impact Assessment, which emphasizes the importance of multi-aspect assessment for informed decision-making. By examining these dimensions, a comprehensive understanding of a sustainable road infrastructure development project is gained, shedding light on the measures and considerations that contribute to a project's long-term success and positive societal impact.

2.6.1 Economic Sustainability

Economic sustainability in road infrastructure development is crucial for ensuring long-term benefits and viability. This section reviews empirical studies on the economic sustainability of road infrastructure projects, focusing on key indicators such as funding adequacy, economic feasibility, regional economic impact, and cost-benefit analysis.

The stability and adequacy of funding are fundamental to the economic sustainability of road infrastructure projects. According to Suprayoga et al. (2020), consistent and reliable funding sources are essential for the successful completion and maintenance of infrastructure projects. The study highlights that projects with stable funding sources are more likely to achieve their intended economic outcomes and avoid delays and cost overruns (Suprayoga et al., 2020).

Economic feasibility involves assessing whether the benefits of a project justify the costs incurred. A study by Vijayakumar et al. (2023) emphasizes the importance of conducting thorough economic feasibility studies to ensure that road infrastructure projects provide value to users and stakeholders. The research indicates that projects with high economic feasibility tend to attract more investment and support from both public and private sectors (Vijayakumar et al., 2023).

Road infrastructure projects significantly impact local and regional economic development. Research by Reddy (2018) demonstrates that well-planned road projects can enhance economic activities by improving accessibility and reducing transportation costs. This, in turn, stimulates local businesses and attracts new investments, contributing to overall economic growth (Reddy, 2018).

Cost-Benefit Analysis (CBA) is a critical tool for evaluating the economic sustainability of road infrastructure projects. The study by Suprayoga et al. (2020) suggests that CBA helps in identifying projects that offer the highest return on investment. By comparing the costs and benefits, decision-makers can prioritize projects that provide the greatest economic advantages while minimizing financial risks (Suprayoga et al., 2020).

Economic sustainability is a vital aspect of road infrastructure development, ensuring that projects are financially viable and contribute to broader economic goals. Empirical studies underscore the importance of stable funding, economic feasibility, regional economic impact, and rigorous cost-

benefit analysis in achieving sustainable outcomes. Future research should continue to explore these dimensions to enhance the economic sustainability of road infrastructure projects.

2.6.2 Social Sustainability

Social sustainability in road infrastructure development is essential for ensuring that projects benefit all segments of society and contribute positively to community well-being. This section reviews empirical studies on the social sustainability of road infrastructure projects, focusing on key indicators such as equitable benefit distribution, community well-being, stakeholder involvement, accessibility, and safety.

Ensuring that the benefits of road infrastructure are equitably distributed among different social groups is a critical aspect of social sustainability. According to Vijayakumar et al. (2023), equitable distribution helps in reducing social inequalities and promoting inclusive development. The study highlights that projects designed with a focus on social equity are more likely to gain public support and achieve long-term sustainability (Vijayakumar et al., 2023).

Road infrastructure projects can significantly impact community well-being and social structures. Reddy (2018) found that well-planned road projects enhance the quality of life by improving access to essential services and economic opportunities. The research indicates that such projects can strengthen social cohesion and support the development of vibrant communities (Reddy, 2018).

Stakeholder involvement is crucial for the social sustainability of road infrastructure projects. A study by Arshad et al. (2021) emphasizes the importance of including all relevant parties in the decision-making process to ensure that diverse perspectives are considered. This inclusive approach leads to more socially acceptable and sustainable outcomes (Arshad et al., 2021).

Accessibility is a key measure of social sustainability. Research by Suprayoga et al. (2020) suggests that road infrastructure should be designed to be usable by all intended users, including vulnerable groups such as the elderly and disabled. Ensuring accessibility enhances social inclusion and maximizes the benefits of infrastructure investments (Suprayoga et al., 2020).

Safety is a fundamental component of social sustainability. According to Reddy (2018), reducing accidents and enhancing user security are essential for protecting public health and well-being. The study highlights that safety improvements in road infrastructure can lead to significant social

benefits, including reduced healthcare costs and increased public confidence in transportation systems (Reddy, 2018).

Social sustainability is a vital aspect of road infrastructure development, ensuring that projects are inclusive, equitable, and beneficial to all community members. Empirical studies underscore the importance of equitable benefit distribution, community well-being, stakeholder involvement, accessibility, and safety in achieving socially sustainable outcomes. Future research should continue to explore these dimensions to enhance the social sustainability of road infrastructure projects.

2.6.3 Environmental Sustainability

Environmental sustainability in road infrastructure development is crucial for minimizing negative impacts on the environment and ensuring long-term ecological balance. This section reviews empirical studies on the environmental sustainability of road infrastructure projects, focusing on key indicators such as pollution minimization, life cycle environmental impact assessment, and effects on natural ecosystems and biodiversity.

Minimizing environmental pollution is a fundamental aspect of sustainable road infrastructure. According to Montgomery et al. (2015), implementing environmentally sustainable road criteria can significantly reduce pollution levels during construction and operation phases. The study emphasizes the importance of adopting green technologies and practices to mitigate air, water, and soil pollution (Montgomery et al., 2015).

A comprehensive evaluation of environmental impacts throughout the project's life cycle is essential for sustainable road infrastructure. Arshad et al. (2021) propose a Life Cycle Sustainability Assessment (LCSA) framework that integrates environmental, social, and economic dimensions. This approach helps in identifying and mitigating adverse environmental impacts at different stages of the project, from planning to decommissioning (Arshad et al., 2021).

Road infrastructure projects can have significant consequences for natural ecosystems and biodiversity. Research by Suprayoga et al. (2020) highlights the need for careful planning and implementation to avoid habitat destruction and biodiversity loss. The study suggests incorporating biodiversity conservation measures into project designs to protect and enhance natural ecosystems (Suprayoga et al., 2020).

Environmental sustainability is a critical component of road infrastructure development, ensuring that projects are ecologically responsible and sustainable. Empirical studies underscore the importance of pollution minimization, life cycle environmental impact assessment, and biodiversity conservation in achieving environmentally sustainable outcomes. Future research should continue to explore these dimensions to enhance the environmental sustainability of road infrastructure projects.

2.6.4 Technical and Operational Sustainability

Technical and operational sustainability in road infrastructure development is essential for ensuring that projects are effectively planned, executed, and maintained over their lifecycle. This section reviews empirical studies on the technical and operational sustainability of road infrastructure projects, focusing on key indicators such as project planning, design appropriateness, execution efficiency, infrastructure upkeep, and resilience.

Effective project planning is a cornerstone of technical and operational sustainability. According to Suprayoga et al. (2020), comprehensive and realistic planning helps in identifying potential risks and allocating resources efficiently. The study emphasizes that well-planned projects are more likely to be completed on time and within budget, thereby enhancing their sustainability (Suprayoga et al., 2020).

The design of road infrastructure must align with the project goals to ensure sustainability. Arshad et al. (2021) highlight that appropriate design not only meets the functional requirements but also incorporates sustainability principles. This includes using durable materials, considering environmental impacts, and ensuring the infrastructure can adapt to future needs (Arshad et al., 2021).

Efficient and timely execution of road infrastructure projects is critical for operational sustainability. Montgomery et al. (2015) found that projects executed efficiently tend to have lower costs and reduced environmental impacts. The study suggests that adopting best practices in project management and construction can significantly improve execution efficiency (Montgomery et al., 2015).

Regular maintenance and preservation are vital for the long-term sustainability of road infrastructure. Research by Suprayoga et al. (2020) indicates that ongoing upkeep helps in

extending the lifespan of infrastructure and preventing costly repairs. The study recommends implementing systematic maintenance schedules and using advanced monitoring technologies to ensure infrastructure remains in good condition (Suprayoga et al., 2020).

Resilience is a key aspect of technical and operational sustainability. Arshad et al. (2021) emphasize the importance of designing infrastructure that can withstand and recover from adverse conditions such as natural disasters and climate change. The study highlights that resilient infrastructure not only protects investments but also ensures continuous service delivery during and after adverse events (Arshad et al., 2021).

Technical and operational sustainability is crucial for the successful development and maintenance of road infrastructure projects. Empirical studies underscore the importance of comprehensive planning, appropriate design, efficient execution, regular upkeep, and resilience in achieving sustainable outcomes. Future research should continue to explore these dimensions to enhance the technical and operational sustainability of road infrastructure projects.

2.6.5 Performance and Impact Assessment

Performance and impact assessment are critical components of sustainable road infrastructure development. This section reviews empirical studies on the performance and impact assessment of road infrastructure projects, focusing on key indicators such as multi-aspect assessment for decision-making and improvements in the movement of people and goods.

Comprehensive assessment of multiple aspects is essential for informed decision-making in road infrastructure projects. According to Suprayoga et al. (2020), integrating various sustainability indicators into the assessment process helps in capturing the full spectrum of a project's impacts. This approach ensures that economic, social, and environmental dimensions are considered, leading to more balanced and sustainable outcomes (Suprayoga et al., 2020).

Arshad et al. (2021) propose a life cycle sustainability assessment (LCSA) framework that evaluates projects from planning to decommissioning. This holistic approach allows for the identification of potential risks and benefits at each stage, facilitating better decision-making and enhancing project sustainability (Arshad et al., 2021).

Improving the movement of people and goods is a key performance indicator for road infrastructure projects. Research by Khanani et al. (2020) highlights that well-designed road

projects can significantly enhance transportation efficiency, reduce travel time, and lower transportation costs. These improvements contribute to economic growth and social well-being by facilitating better access to markets, services, and opportunities (Khanani et al., 2020).

Montgomery et al. (2015) found that road infrastructure projects that prioritize efficient movement of people and goods tend to have higher economic and social returns. The study suggests that incorporating advanced transportation technologies and practices can further enhance these benefits, making road infrastructure projects more sustainable (Montgomery et al., 2015).

Performance and impact assessment are vital for ensuring the sustainable development of road infrastructure projects. Empirical studies underscore the importance of multi-aspect assessment for informed decision-making and the enhancement of transportation efficiency. Future research should continue to explore these dimensions to improve the sustainability of road infrastructure projects.

Category	Sustainable Performance Measures	Source
Project Planning and Delivery	Adequacy and stability of funding sources.	Suprayoga et al. (2020); Vijayakumar et al. (2023);
	Comprehensive and realistic project planning.	
	Appropriateness of design to meet project goals.	
	Efficiency and timeliness of project execution.	
	Ongoing upkeep and preservation of infrastructure.	
	Assessment of multiple aspects to inform decision-making.	
Social and Economic Impact	The extent to which the infrastructure is usable by all intended users.	Reddy (2018); Arshad et al. (2021).
	Improvement in the movement of people and goods.	
	Reduction in accidents and enhancement of user security.	
	Economic feasibility for users and stakeholders.	
	Fair distribution of infrastructure benefits among different social groups.	
	Influence on local and regional economic development.	
	Effects on community well-being and social structures.	
	Involvement of all relevant parties in decision-making processes.	
	Ability to withstand and recover from adverse conditions.	

Environmental and Resilience Factors	Minimization of environmental pollution.	Montgomery et al. (2015); Suprayoga et al. (2020).
	Evaluation of environmental impacts throughout the project's life cycle.	
	Comparison of project costs against benefits.	
	Consequences for natural ecosystems and biodiversity.	

2.7 The Nexus Between Public Procurement Management Maturity and Performance of Road Infrastructure Development Projects

The relationship between public procurement management maturity and road infrastructure development projects can be positive or negative, depending on the level of maturity. A positive nexus suggests that a high level of public procurement management maturity leads to better quality and performance of road infrastructure development projects. This can be achieved through sound and consistent policies, selecting and contracting qualified contractors and suppliers, monitoring and evaluating project implementation and outcomes, and considering economic, social, and environmental factors in decisions. (OECD, 2021; World Bank, 2016; World Bank, 2018; UNEP, 2017).

Conversely, a negative nexus suggests that a low level of public procurement management maturity leads to poor quality and performance of road infrastructure development projects. This can be caused by weak and inconsistent policies, unqualified and incompetent contractors and suppliers, failure to monitor and evaluate project outcomes, and neglecting economic, social, and environmental considerations in public procurement decisions. Negative externalities, such as pollution, congestion, accidents, and displacement of people and communities, can result from these issues. Therefore, it is crucial to ensure that public procurement management maturity is balanced with the quality and performance of road infrastructure development projects (Chigudu, 2013; World Bank, 2016; World Bank, 2018; World Bank, 2010).

Lenferink et al. (2013) examined how public procurement management practice affects the sustainability of road infrastructure development. They argued that the use of integrated contracts, such as Design-Build-Finance-Maintain (DBFM), can link the design, construction and maintenance stages of the project lifecycle, and thus improve the project performance. They defined project performance by the inclusiveness of the actors, scope and time dimensions, which

reflect the social, economic and environmental aspects of sustainability. They found that integrated contracts can foster a positive relationship between public procurement management practice and sustainability, as they can enhance the cooperation and coordination among the actors, increase the scope of quality and environmental criteria, and optimize the lifecycle costing and management of the infrastructure. However, they also noted that the relationship is dynamic, as public procurement management practice needs to adapt to the changing needs and expectations of the stakeholders and the society.

One of the key aspects of managing public projects, such as road infrastructure projects, is public procurement management practice, which refers to the methods and processes used to acquire goods and services for such projects. The performance of these projects depends on how well they meet their objectives, such as quality, cost, time, and scope. Byaruhanga and Basheka (2017) suggest that there is a positive relationship between public procurement management practice and project performance, meaning that better procurement practices lead to better project outcomes. They also identify some of the factors that affect this relationship, such as contractor monitoring, procurement rules, contractor and contract supervisor appraisal, contractor payment, and project monitoring and evaluation. They imply that improving these factors can enhance the relationship between public procurement management practice and project performance, and thus improve the performance of road infrastructure projects in Uganda.

Ramlugan (2014) examined the impact of public procurement management practices on the performance of road infrastructure projects in Mauritius. The study found that these projects were often plagued by poor performance due to various factors, such as insufficient funding, lack of coordination among stakeholders, lack of transparency in the procurement process, lack of a clear legal framework, and lack of alignment between the public and private sectors. The study also explored the potential of public-private partnerships (PPPs) as an alternative mode of public service delivery that could improve the performance of road infrastructure projects by increasing the efficiency, quality, innovation, and sustainability of the outcomes. However, the study also recognized the challenges and risks associated with PPPs, such as political instability, regulatory uncertainty, contractual complexity, financial constraints, and environmental concerns. Therefore, the study concluded that the relationship between public procurement management practice and

project performance was not linear or simple, but rather dynamic and contingent on various contextual factors.

2.7.1 Factors Influencing the Nexus and Case Studies

Adamu et al. (2016) examined the factors that affect the relationship between public procurement management practice and project performance in Nigeria, focusing on the road infrastructure sector. They identified the choice of the PPP model, the quality of the bankable feasibility study, the level of stakeholder engagement, the mitigation of social and environmental impacts, and the alignment of the project with the national policy and institutional framework as the key determinants of project performance. They argued that by adopting effective public procurement management practice, Nigeria can enhance project performance in terms of attracting more private sector investment, improving service delivery, reducing cost and time overruns, and ensuring the sustainability of the project. However, they also acknowledged the challenges and gaps in the current public procurement management practice in Nigeria, which impede project performance and call for urgent review and improvement.

In their study, Willar et al. (2020) found a positive relationship between the two variables, indicating that better procurement practices lead to better project outcomes. They also argued that the quality of procurement management practice influences the implementation of sustainable principles in infrastructure projects, as it determines the selection of materials, suppliers, contractors, and partners who can comply with the environmental, social, and economic aspects of sustainability. However, they also identified some challenges and gaps in the current procurement management practice and project performance in Indonesia, such as the lack of awareness, training, and incentives for sustainable construction, and the need for a holistic and integrated approach that involves all stakeholders.

Mills et al. (2011) examined the relationship of public procurement management practices on project performance, focusing on the Alliance form of procurement. This form of procurement entails a collaborative agreement between the client and the contractors to share risks and rewards, and to work as an integrated team. The authors argued that the performance of Alliances is influenced by several factors, such as communication, trust, and preconditions, that affect both the project management and the inter-party relationship. They suggested that the Alliance form of procurement can enhance project performance by creating a cooperative, innovative, and

accountable culture, and by aligning the interests of the client and the contractors. However, they also acknowledged the challenges and risks involved in this form of procurement, such as managing complex contracts, ensuring transparency, and maintaining trust.

Mudi et al. (2016) examined the relationship between public procurement management practice and project performance in the context of public-private partnership (PPP) projects. They found that this relationship was positive and significant, implying that the higher the quality of public procurement management practice, the better the project performance. They also identified some factors that influenced this relationship, such as the project team and leadership, the project preparation funding, the project objectives and scope, the project planning, coordination, and monitoring, the risk allocation and contractual arrangements, the demand forecasts and feasibility studies, and the institutional and legal regulatory framework. Mudi et al. (2016) also proposed some recommendations to improve the public procurement management practice and the project performance, such as revising the national policy on PPP, strengthening the institutional structure and the individual capacity building, and promoting more private sector involvement.

Sheikh and Kiarie (2020) conducted a study to examine how four aspects of public procurement management practice affected the success of roads construction projects under the Kenya National Highways Authority (KeNHA). The four aspects were: procurement planning, which involved defining the procurement requirements, objectives, strategies and activities; tender evaluation, which involved assessing and comparing the bids received from potential suppliers; contract award, which involved selecting and notifying the winning bidder and finalizing the contract terms and conditions; and performance review, which involved monitoring and evaluating the contractor's performance and compliance with the contract requirements. The study revealed a strong positive correlation between the four aspects of public procurement management practice and the project performance, implying that higher levels of these aspects led to higher levels of project success. The study also showed that the four aspects of public procurement management practice accounted for 92% of the variation in project performance, indicating that these factors had a significant impact on the project outcome. Based on these findings, the study recommended that public procurement management practice should be enhanced and implemented in the state corporates and especially in KeNHA, to improve the quality, timeliness and cost-effectiveness of the road's construction projects. The study also proposed that further research should be conducted

on the effects of public procurement management practice on different types of projects and in different sectors.

Factors influencing the relationship between public procurement management and project performance include economic phases, procurement systems, contract management, supplier relationship management, and information sharing. Economic phases affect construction demand and supply, government budget, and industry growth. Traditional procurement systems, such as Malaysia's traditional procurement system, define project delivery roles, responsibilities, risks, and payments. Contract management plans, executes, monitors, and controls contractual agreements among parties. Supplier relationship management manages strategies and practices for interactions with suppliers, such as contractors, subcontractors, consultants, and vendors. Information sharing exchanges and disseminates relevant information among parties, such as project requirements, specifications, progress, issues, and feedback. The relationship between public procurement management practice and project performance is complex and dynamic, relying on the public sector client's ability to manage various factors affecting project delivery (Jaafar and Nuruddin, 2012).

In their study, Alston and Varriano (2008) explored the challenges and opportunities of financing road infrastructure projects, which are a type of public procurement project. They argue that the performance of these projects depends on the choice of financial procurement strategies, cost management techniques, and public private partnerships (PPPs). Financial procurement strategies affect how funds are allocated and distributed for different aspects of the road program, such as maintenance, new development, and operations. Cost management techniques help to optimize the use of resources and ensure value for money in road infrastructure projects. PPPs allow the public sector to benefit from the expertise, innovation, and financing of the private sector, while sharing the risks and responsibilities of delivering and operating road infrastructure projects. However, the authors also acknowledge that there are trade-offs and challenges involved in selecting and implementing these practices, such as budget constraints, regulatory frameworks, and stakeholder interests. Therefore, it can be generalized that the relationship between public procurement management practice and project performance is complex and dynamic, and requires careful planning, monitoring, and evaluation to achieve the desired outcomes.

Starkie (2013) found that different aspects of procurement management practice have various effects on the project performance. For instance, procurement planning can help to optimize the price-quality trade-offs for different transport market segments, and to allocate resources in an efficient and effective manner. Tendering can help to choose the best suppliers and contractors for the transport projects, and to ensure that the procurement process is transparent and accountable. Contract administration can help to oversee and control the quality and cost of the transport services, and to handle risks and changes in the project scope. Moreover, performance measurement can help to assess the outcomes and impacts of the transport projects, and to provide feedback and learning for future improvement. Therefore, the study implied that public procurement management practice is a crucial factor for the success of transport projects, and that it can improve the performance of the projects by providing more choices, lowering costs, increasing benefits, and enhancing quality for the travellers.

Bataw (2016) discussed the impact of the UK Government's mandate to use BIM methods in all public sector construction projects from 2016. BIM is an approach that uses object-oriented modelling of infrastructure and a common data format to enable interoperability and collaboration among various software applications and stakeholders in the design and construction process. He argues that the adoption of BIM methods can improve the public procurement management practice and the project performance in several ways, such as reducing costs and risks by avoiding errors, rework, and delays; improving quality and reliability by ensuring consistency, accuracy, and completeness of data and information; enhancing innovation and efficiency by facilitating design optimization, simulation, and analysis; increasing stakeholder satisfaction by enabling better communication, coordination, and integration; and delivering social, economic, and environmental benefits by supporting sustainability, resilience, and asset management.

2.7.2 Case Studies and Empirical Evidence

Konstantinidis and Antoniou (2003) examined the case of the Egnatia Motorway, a large-scale infrastructure project that spanned 30 years of planning and construction. The project was a joint effort of the European Union and the Greek government, and was overseen by a specialized agency, EOAE. The authors analyzed how the project dealt with various technical, socioeconomical, financial, and political challenges, and how it achieved its intended outcomes of improving the European transport network, enhancing the mobility and interoperability of

transport modes, and stimulating the economic and social development of Northern Greece and neighboring regions. The authors also reported that the project received positive feedback from the stakeholders and the public. Based on this case study, it can be realized that there is a strong relationship between public procurement management practice and project performance, and that good procurement practices lead to good project performance, and vice versa.

In their study, Walcher et al. (2013) explored how public procurement management practice can be affected by the cycle of corruption and integrity, which represent two contrasting modes of organizational behavior. They define corruption as the misuse of entrusted power for personal benefit, which impairs the effectiveness and efficiency of public procurement management practice. As a result of corruption, project costs may increase, quality may decline, delivery may be delayed, and safety may be compromised. On the other hand, they define integrity as the compliance with ethical principles and values, which fosters the transparency and accountability of public procurement management practice. As a consequence of integrity, project costs may decrease, quality may improve, delivery may be timely, and safety may be enhanced. Therefore, they argue that the relationship between public procurement management practice and project performance is positive when integrity prevails, and negative when corruption prevails. The study suggests that public procurement management practice can improve project performance by preventing, detecting, and punishing corruption, and by encouraging integrity within the organization and the society.

2.8 Management Strategies for Enhancing Public Procurement Management Maturity

This literature review explores six key strategies for improving public procurement management maturity. It highlights strategic planning and governance, monitoring and evaluation, risk management, technology and innovation, supplier and contract management, and capacity building and community involvement.

Strategic planning and governance align procurement activities with organizational goals, promoting transparency and accountability. M&E is crucial for tracking the effectiveness of procurement activities, with performance indicators, monitoring systems, and regular audits being essential. Risk management focuses on identifying and mitigating potential risks associated with

procurement processes, with ongoing monitoring and updates. Technology and innovation, such as Artificial Intelligence, e-procurement systems, and data analytics, enhance efficiency, transparency, and decision-making. Supplier and contract management, such as strategic sourcing, category management, and standardized contract templates, optimize procurement processes and achieve value for money. Capacity building and community involvement are essential for maintaining skilled staff. Implementing these strategies can lead to a higher level of maturity in public procurement, contributing to sustainable road infrastructure development projects.

2.8.1 Strategic Planning and Governance

Public procurement management maturity is crucial for the effective and sustainable performance of infrastructure projects. This literature review explores strategic planning and governance as key management strategies to enhance public procurement management maturity, particularly in the context of road infrastructure development projects in Adama City.

Strategic planning in public procurement involves aligning procurement activities with the broader organizational goals and objectives. It includes the development of a mission, vision, and values statement specific to the procurement function, which guides the strategic direction and decision-making processes (NIGP, 2024). Effective strategic planning ensures that procurement activities are proactive, well-coordinated, and aligned with the long-term goals of the organization.

Strategic procurement planning transforms an organization's mission, goals, and objectives into measurable activities that can be used to plan, budget, and manage the procurement function. This approach brings about positive changes in organizational culture, systems, and operational processes (NIGP, 2024). By setting clear goals and objectives, public procurement entities can improve their efficiency and effectiveness, ultimately leading to better project outcomes.

Governance in public procurement refers to the establishment of rules, standards, and procedures that ensure transparency, accountability, and responsibility in procurement activities. Good governance practices are essential for building trust and credibility in the procurement process, which is critical for achieving sustainable performance in infrastructure projects (OECD, 2019). Governance frameworks should integrate environmental and social considerations into procurement decisions, promoting sustainable development goals. This includes adopting green procurement practices, supporting Small and Medium-Sized Enterprises (SMEs), and encouraging

innovation through procurement (OECD, 2019). By incorporating these elements, public procurement can contribute to broader policy objectives and enhance the overall maturity of the procurement function.

Transparency and accountability are fundamental principles of good governance in public procurement. Transparent procurement processes ensure that all stakeholders have access to relevant information, which helps prevent corruption and promotes fair competition. Accountability mechanisms, such as performance measurement and reporting, ensure that procurement activities are conducted in accordance with established rules and standards (Rendon, 2008).

Alternative procurement models, such as public-private partnerships (PPPs) and framework agreements, can enhance procurement management maturity by providing more flexible and efficient procurement solutions. These models allow for better risk management, innovation, and value for money in procurement activities (McKinsey & Company, 2024). By adopting alternative procurement models, public procurement entities can improve their capacity to deliver complex infrastructure projects effectively.

Strategic planning and governance are critical management strategies for enhancing public procurement management maturity. By aligning procurement activities with organizational goals, establishing robust governance frameworks, promoting transparency and accountability, and utilizing alternative procurement models, public procurement entities can improve their efficiency and effectiveness. These strategies are essential for achieving sustainable performance in road infrastructure development projects in Adama City.

2.8.2 Monitoring and Evaluation

Monitoring and evaluation (M&E) are critical components of public procurement management maturity. This literature review examines the role of M&E in enhancing public procurement management maturity, particularly in the context of road infrastructure development projects in Adama City. A robust M&E framework is essential for tracking the implementation and impact of procurement activities. Such a framework should include clear objectives, defined roles and responsibilities, and standardized procedures for data collection and analysis (One Planet Network,

2022). Establishing an M&E framework helps ensure that procurement processes are transparent, accountable, and aligned with organizational goals.

Performance indicators are vital for measuring the effectiveness of procurement activities. These indicators should be specific, measurable, achievable, relevant, and time-bound (SMART) to provide meaningful insights into procurement performance (Rendon, 2008). Common performance indicators include cost savings, procurement cycle time, supplier performance, and compliance with procurement policies (Rendon, 2008).

Effective monitoring systems are necessary to track procurement processes and outcomes. These systems can include electronic procurement platforms, which facilitate real-time data collection and analysis (OECD, 2019). By leveraging technology, public procurement entities can enhance their ability to monitor procurement activities, identify areas for improvement, and ensure compliance with established standards.

Regular audits and assessments are crucial for maintaining the integrity and effectiveness of procurement processes. Audits help identify discrepancies, inefficiencies, and areas of non-compliance, providing opportunities for corrective actions (Bizfluent, 2024). Assessments, on the other hand, evaluate the overall performance of the procurement function and its alignment with organizational objectives (McKinsey & Company, 2024).

Feedback and grievance redressal mechanisms are important for addressing stakeholder concerns and improving procurement processes. These mechanisms provide a platform for stakeholders to voice their opinions, report issues, and suggest improvements (One Planet Network, 2022). By incorporating feedback, public procurement entities can enhance transparency, accountability, and stakeholder satisfaction.

Monitoring and evaluation are essential strategies for enhancing public procurement management maturity. By establishing a robust M&E framework, developing performance indicators, implementing monitoring systems, conducting regular audits and assessments, and establishing feedback and grievance redressal mechanisms, public procurement entities can improve their efficiency and effectiveness. These strategies are crucial for achieving sustainable performance in road infrastructure development projects in Adama City.

2.8.3 Risk Management

Risk management is a fundamental aspect of enhancing public procurement management maturity. This literature review explores the role of risk management in public procurement, particularly in the context of road infrastructure development projects in Adama City.

Effective risk management begins with the identification and assessment of potential risks. These risks can stem from various sources, including supplier reliability, market fluctuations, regulatory changes, and internal organizational factors (OECD, 2023). Tools such as risk registers and risk matrices are commonly used to systematically identify and evaluate these risks (OECD, 2023). By understanding the nature and potential impact of these risks, procurement entities can prioritize their risk management efforts.

Once risks are identified and assessed, the next step is to develop strategies to mitigate these risks. Mitigation strategies may include diversifying the supplier base, implementing robust contract management practices, and adopting flexible procurement models (GEP, 2022). These strategies help reduce the likelihood and impact of risks, ensuring that procurement activities can proceed smoothly even in the face of uncertainties.

Contingency planning is a critical component of risk management. It involves preparing for potential disruptions by developing plans that can be activated in response to specific risk events (ZipHQ, 2024). Contingency plans should outline the steps to be taken in the event of supplier failure, market volatility, or other disruptions. By having these plans in place, procurement entities can respond quickly and effectively to minimize the impact of disruptions on project timelines and outcomes.

Integrating risk management strategies into the procurement process enhances the overall maturity of public procurement management. This integration involves continuous monitoring and evaluation of risks, as well as regular updates to risk management plans based on new information and changing circumstances (OECD, 2023). By embedding risk management into the procurement process, public procurement entities can improve their resilience and adaptability, leading to better project performance and sustainability.

Risk management is a crucial strategy for enhancing public procurement management maturity. By identifying and assessing risks, developing mitigation strategies, establishing contingency

plans, and continuously enhancing procurement processes with risk management strategies, public procurement entities can improve their efficiency and effectiveness. These efforts are essential for achieving sustainable performance in road infrastructure development projects in Adama City.

2.8.4 Technology and Innovation

Technology and innovation play a pivotal role in enhancing public procurement management maturity. This literature review explores the impact of digital technologies and innovative practices on public procurement.

Digital technologies, such as artificial intelligence (AI), machine learning, and Robotic Process Automation (RPA), are transforming public procurement by automating routine tasks and optimizing procurement processes. These technologies enhance efficiency, reduce errors, and free up resources for more strategic activities (McKinsey & Company, 2024). For instance, AI can be used to analyze procurement data, predict demand, and identify the best suppliers, thereby improving decision-making and procurement outcomes (McKinsey & Company, 2024).

Integrating procurement systems enables better data management and analytics, which are crucial for informed decision-making. Advanced analytics tools can process large volumes of procurement data to uncover insights, trends, and patterns that can inform procurement strategies (OECD, 2023). By leveraging data analytics, public procurement entities can enhance their ability to monitor performance, identify risks, and make data-driven decisions (OECD, 2023).

E-procurement systems streamline procurement processes by providing a digital platform for managing procurement activities. These systems enhance efficiency by automating procurement workflows, reducing paperwork, and speeding up procurement cycles (Pipefy, 2024). Additionally, e-procurement systems promote transparency by providing a clear audit trail of procurement activities, which helps prevent corruption and ensures accountability (Pipefy, 2024).

Data analytics and digital platforms are essential for improving decision-making in public procurement. These tools provide real-time insights into procurement activities, enabling procurement managers to make informed decisions quickly (Quadrant Four, 2024). For example, digital dashboards can display key performance indicators (KPIs) and other relevant metrics, allowing procurement managers to monitor performance and make adjustments as needed (Quadrant Four, 2024).

Technology enhances information sharing and communication among stakeholders in the procurement process. Digital platforms facilitate collaboration by providing a centralized repository for procurement documents and communications (OECD, 2023). This improves coordination and ensures that all stakeholders have access to the information they need to make informed decisions (OECD, 2023).

E-procurement platforms streamline procurement processes by automating tasks such as supplier registration, bid submission, and contract management. These platforms improve efficiency by reducing the time and effort required to complete procurement activities (Pipefy, 2024). Moreover, e-procurement platforms enhance transparency by providing a clear and accessible record of all procurement activities (Pipefy, 2024).

Technology and innovation are critical strategies for enhancing public procurement management maturity. By leveraging digital technologies for automation and optimization, integrating procurement systems for data management and analytics, adopting e-procurement systems, using data analytics and digital platforms, enhancing information sharing and communication, and utilizing e-procurement platforms, public procurement entities can improve their efficiency, transparency, and effectiveness. These strategies are essential for achieving sustainable performance in road infrastructure development projects in Adama City.

2.8.5 Supplier and Contract Management

Supplier and contract management are critical components of public procurement management maturity. This literature review examines the role of these strategies in enhancing public procurement.

Strategic sourcing and category management are essential for optimizing procurement processes and achieving better value for money. Strategic sourcing involves a comprehensive approach to acquiring goods and services, focusing on long-term relationships with suppliers and considering total cost of ownership (McKinsey & Company, 2024). Category management, on the other hand, involves managing procurement spend by grouping similar items into categories and developing tailored strategies for each category (Tipalti, 2024). This approach helps in identifying opportunities for cost savings, improving supplier performance, and mitigating risks (Tipalti, 2024).

Effective contract management ensures that procurement contracts are executed as intended, with both parties fulfilling their obligations. This involves the creation, negotiation, execution, and monitoring of contracts to ensure compliance and performance (Procurement Tactics, 2024). Supplier Relationship Management (SRM) focuses on building and maintaining strong relationships with key suppliers to foster collaboration, innovation, and continuous improvement (Thomasnet, 2024). SRM practices include regular performance reviews, joint problem-solving, and strategic partnerships (Thomasnet, 2024).

Standardized contract templates are crucial for streamlining the procurement process and ensuring consistency in contract terms and conditions. These templates provide a framework for drafting contracts, reducing the time and effort required for contract preparation and negotiation (Procurement Tactics, 2024). They also help in mitigating risks by ensuring that all necessary clauses and provisions are included, thereby protecting the interests of both parties (Procurement Tactics, 2024).

Public-private partnerships (PPPs) are an effective way to leverage private sector expertise and innovation in public procurement. PPPs involve collaboration between public and private entities to deliver infrastructure projects, with both parties sharing risks and rewards (OECD, 2023). These partnerships can enhance procurement management maturity by bringing in new technologies, innovative solutions, and best practices from the private sector (OECD, 2023). Additionally, PPPs can improve project outcomes by ensuring that projects are delivered on time, within budget, and to the required quality standards (OECD, 2023).

Supplier and contract management are vital strategies for enhancing public procurement management maturity. By adopting strategic sourcing and category management, implementing effective contract and supplier relationship management, developing standardized contract templates, and promoting partnerships with the private sector, public procurement entities can improve their efficiency, effectiveness, and sustainability. These strategies are essential for achieving sustainable performance in road infrastructure development projects in Adama City.

2.8.6 Capacity Building and Community Involvement

Capacity building and community involvement are essential strategies for enhancing public procurement management maturity. This literature review explores the impact of these strategies on public procurement.

Continuous learning and development are crucial for maintaining a skilled and knowledgeable procurement workforce. Training programs and professional development opportunities help procurement staff stay updated with the latest practices, regulations, and technologies (OECD, 2023). By investing in continuous learning, public procurement entities can enhance their capacity to manage complex procurement processes and improve overall performance (OECD, 2023).

Ongoing training is vital for equipping procurement staff with the necessary skills and knowledge to perform their duties effectively. Training programs should cover various aspects of procurement, including strategic sourcing, contract management, risk management, and ethical practices (World Bank, 2024). Regular training sessions help ensure that procurement staff are well-prepared to handle the challenges of modern procurement and contribute to the maturity of the procurement function (World Bank, 2024).

Community involvement in public procurement processes enhances transparency, accountability, and public trust. Engaging local communities and civil society organizations in monitoring procurement activities helps ensure that procurement decisions reflect the needs and priorities of the community (CUTS, 2023). Community participation can also help identify and address potential issues early in the procurement process, leading to better project outcomes (CUTS, 2023).

Capacity building and community involvement offer several benefits for public procurement management maturity. These strategies help build a more competent and responsive procurement workforce, improve stakeholder engagement, and promote sustainable procurement practices (OECD, 2023). Additionally, involving communities in procurement processes fosters greater transparency and accountability, which are critical for achieving sustainable performance in infrastructure projects (CUTS, 2023).

Capacity building and community involvement are essential strategies for enhancing public procurement management maturity. By encouraging continuous learning and development, providing ongoing training for procurement staff, and involving local communities and civil

society, public procurement entities can improve their efficiency, effectiveness, and sustainability. These strategies are crucial for achieving sustainable performance in road infrastructure development projects in Adama City.

Category	Strategies for Improving Public Procurement Management Maturity	Source
Develop a clear public procurement policy and strategy	Outline vision, mission, values, and stakeholder roles.	NIGP (2024); OECD (2019)
	Establish monitoring and evaluation framework.	
	Set clear rules, standards, and procedures.	
	Promote transparency, accountability, and responsibility.	
	Adopt strategic sourcing and category management.	
	Implement effective contract and supplier relationship management.	
	Enhance procurement with risk management strategies.	
	Leverage digital technologies for automation and optimization.	
	Integrate procurement systems for data management and analytics.	
	Encourage continuous learning and development.	
Strengthen procurement practices	Involve local communities and civil society.	Rendon (2008); OECD (2019)
	Establish feedback and grievance redressal mechanisms.	
	Develop performance indicators for procurement effectiveness.	
	Implement monitoring systems to track processes and outcomes.	
	Conduct regular audits and assessments.	
	Adopt e-procurement systems for efficiency and transparency.	
	Use data analytics and digital platforms for improved decision-making.	
	Enhance information sharing and communication through technology.	
Implement risk management	Identify and assess procurement risks.	GEP (2022); ZipHQ (2024); McKinsey & Company (2024).
	Develop mitigation strategies.	
	Establish contingency plans for disruptions.	
	Promote partnerships with private sector for innovation and expertise.	
	Integrate environmental and social considerations.	
	Utilize alternative procurement models.	

Standardize and automate procedures	Implement standardized and efficient procedures.	OECD (2023); World Bank (2024); CUTS (2023).
	Utilize e-procurement platforms to streamline processes.	
	Develop contract templates.	
	Provide ongoing training for procurement staff.	

2.9 Summary of Literature Review

This study investigates the relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City, Ethiopia. The literature review identifies key aspects of both concepts and explores the existing research on their connection.

The literature emphasizes four crucial areas for achieving public procurement management maturity:

- **Strategic Alignment & Performance:** Effective procurement aligns with organizational objectives, utilizes performance measurement through KPIs, and integrates seamlessly with broader strategic plans (Patrucco et al., 2017; Walker & Rowlinson, 2008).
- **Organizational Structure & Capability:** A well-defined structure with dedicated teams, clear roles, leadership support, and continuous staff development are essential (Patrucco et al., 2017; Harland et al., 2007).
- **Process Efficiency & Innovation:** Standardized procedures, modern technology, and innovative practices streamline procurement processes. Defined methods for supplier selection, evaluation, and relationship management are crucial, along with continuous improvement through performance metrics (Patrucco et al., 2017; Walker & Rowlinson, 2008).
- **Ethics & Sustainability:** Integrating sustainability and social responsibility into procurement decisions fosters long-term success. Ethical practices, effective policies, and impact assessments on local communities and the environment are vital for sustainable development (Brammer & Walker, 2011; Patrucco et al., 2017).

In addition, five dimensions define the sustainable performance of road infrastructure projects:

- **Economic Sustainability:** Examines financial viability, economic feasibility, regional economic impact, and cost-benefit analysis (Suprayoga et al., 2020; Vijayakumar et al., 2023; Reddy, 2018).
- **Social Sustainability:** Focuses on equitable distribution of benefits, community well-being, stakeholder involvement, accessibility, and safety (Vijayakumar et al., 2023; Reddy, 2018; Arshad et al., 2021; Suprayoga et al., 2020).
- **Environmental Sustainability:** Emphasizes pollution minimization, life cycle environmental impact assessment, and effects on ecosystems and biodiversity (Montgomery et al., 2015; Arshad et al., 2021; Suprayoga et al., 2020).
- **Technical and Operational Sustainability:** Concentrates on project planning, design appropriateness, execution efficiency, infrastructure upkeep, and resilience (Suprayoga et al., 2020; Arshad et al., 2021; Montgomery et al., 2015).
- **Performance and Impact Assessment:** Highlights the importance of multi-dimensional assessment for informed decision-making, considering economic, social, and environmental impacts (Suprayoga et al., 2020).

Moreover, the literature suggests a positive correlation between procurement management maturity and project sustainability. A high level of maturity leads to better quality, performance, and sustainability through sound policies, qualified contractors, project monitoring, and consideration of economic, social, and environmental factors (OECD, 2021; World Bank, 2016, 2018; UNEP, 2017). Conversely, a low level of maturity can lead to poor quality, performance, and negative environmental and social impacts (Chigudu, 2013; World Bank, 2016, 2018, 2010). Procurement practices influence project performance through factors like contractor monitoring, procurement rules, and stakeholder engagement (Byaruhanga & Basheka, 2017). Integrated contracts (DBFM) can promote sustainability by fostering collaboration and lifecycle considerations (Lenferink et al., 2013). Public-private partnerships (PPPs) have the potential to improve performance but require careful consideration of challenges (Adamu et al., 2016; Ramlugan, 2014; Mudi et al., 2016). Strategies for enhancing procurement maturity include strategic planning, effective governance, monitoring & evaluation, risk management, technology & innovation, supplier & contract management, and capacity building.

This review establishes the theoretical foundation for this study, which explores the specific relationship between public procurement management maturity and sustainable performance of road infrastructure development projects in the context of Adama City, Ethiopia.

2.10 Research Gaps

This study addresses critical research gaps in the understanding of the relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects, particularly in developing countries. Existing research often focuses on developed economies, neglecting the specific context of developing nations. This study directly investigates this relationship in Adama City, Ethiopia, providing valuable insights for similar settings. Furthermore, prior research explores various aspects of procurement maturity in isolation. This study examines the interrelationships between these dimensions and their combined effect on sustainable performance. This holistic approach provides a more comprehensive understanding of how procurement practices influence project outcomes.

Additionally, existing performance indicators might not be fully applicable to developing countries. This research aims to develop or adapt a framework for assessing sustainable performance of road projects in Adama City, considering both project characteristics and local factors. There is also limited research on implementing sustainable procurement practices within a specific developing country context. This study investigates how to implement such practices in Adama City, considering its unique social, economic, and environmental landscape. Finally, limited research exists on the long-term social, economic, and environmental impacts of road infrastructure projects in developing countries. This study aims to assess these long-term impacts in Adama City.

By addressing these gaps, your research offers valuable contributions to improving public procurement practices in developing countries and achieving sustainable road infrastructure development. This includes providing a nuanced understanding of the relationship between procurement maturity and sustainable performance specific to Adama City. The research offers a potentially adaptable framework for assessing sustainable performance of road projects in developing countries. This study also provides practical guidance on implementing sustainable procurement practices within the context of Adama City, potentially serving as a model for other developing countries. Finally, the research sheds light on the long-term social, economic, and

environmental impacts of road infrastructure projects in a developing country context. These contributions can inform policy changes, improve procurement practices, and ultimately promote the development of sustainable road infrastructure in Adama City and beyond.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research methodology used to explore the link between public procurement management and the sustainability of road projects in Adama City, Ethiopia. A mixed-methods approach employing surveys and interviews was used to gather data from a representative sample of professionals involved in such projects. The chapter also discusses how the data was analyzed to ensure reliability and validity, and the potential generalizability of the findings to similar contexts.

3.2 Study Area

This research investigates the relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects within the urban context of Adama City, Ethiopia (See Figure 3.1). Adama, situated in the Oromia Regional State, is one of the largest cities in Ethiopia and a crucial hub for commerce and transportation. Its rapid urbanization necessitates continuous development of its road infrastructure, making it an ideal case study for exploring how procurement practices influence the sustainability of these projects.

Choosing Adama City allows for a focused examination within a well-defined geographical area. Existing research suggests a link between effective public procurement and sustainable infrastructure development (Treviño-Lozano, 2021). By analyzing projects within Adama's boundaries, this study aims to contribute to this field of knowledge by providing empirical evidence specific to the Ethiopian context. The focus on Adama City also enables a more in-depth exploration of the local procurement landscape, considering factors like the availability of qualified contractors and consultants specific to the region. This geographically-defined study area strengthens the research design by allowing for a controlled analysis and the collection of targeted data on both public procurement practices and the subsequent performance of road infrastructure projects within Adama City.

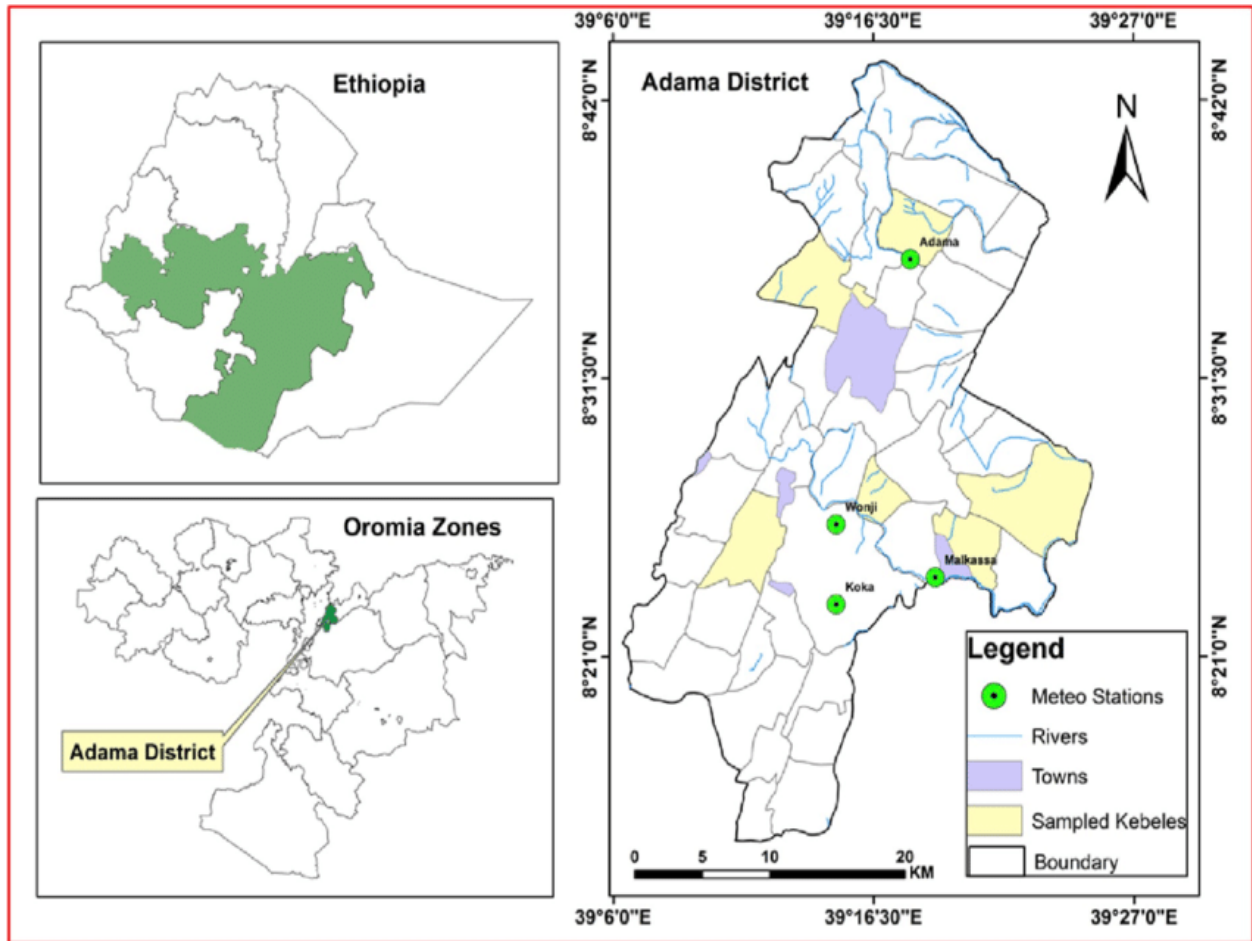


Figure 3.1 Geographical location of Adama city, Ethiopia (Hundera et al., 2019)

3.3 Research Design and Approach

This research adopted a mixed-methods approach to comprehensively investigate the relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City. By leveraging the strengths of both quantitative and qualitative data collection methods, the study aimed to gain a nuanced understanding of the research topic.

Data collection encompassed two primary sources. First, a self-administered questionnaire was distributed to a sample of 94 professionals strategically selected through stratified random sampling. This approach ensured representation from various stakeholder groups within Adama City's road infrastructure projects (Client/Municipality, Regulatory Body, Contracting Firms, Consulting Agencies). The questionnaire addressed all four research objectives, gathering data on

public procurement management maturity, sustainable performance of road projects, and potential improvement strategies. Second, semi-structured interviews were conducted with eight purposefully selected participants representing each stakeholder group. These interviews served a threefold purpose: refining questionnaire findings through detailed exploration of specific aspects, identifying additional factors influencing the relationship under investigation, and capturing participant experiences and perspectives in their own words.

To complement the primary data collection, the study utilized secondary data sources. Scholarly publications on public procurement management, sustainable infrastructure development, and related fields provided theoretical frameworks and existing research findings. Additionally, official reports and policies from relevant Ethiopian government agencies offered contextual insights into local regulations and practices. Finally, presentations and publications from conferences and industry organizations on public procurement and sustainable infrastructure development practices provided contemporary perspectives and practical applications that informed the research approach.

Data analysis employed a two-pronged approach. Quantitative data from the questionnaire survey was analyzed using descriptive and inferential statistics. Descriptive statistics provided summaries of central tendencies, dispersion, and distribution of variables. Inferential statistics were employed to identify patterns, relationships, and differences between variables, potentially leading to hypothesis testing in relation to the research objectives. Qualitative data from the interviews underwent thematic analysis using a coding approach. This process involved identifying recurring themes and patterns within the participants' responses.

The research design prioritized ensuring both reliability and validity of the findings. Cronbach's alpha coefficient assessed the internal consistency of the questionnaire data, with all sections exceeding a value of 0.7, indicating acceptable internal consistency. Validity was addressed across three key dimensions. Construct validity was ensured through meticulous design of questionnaires and interview guides based on existing literature and piloting for clarity and comprehensiveness. Internal validity was strengthened by employing stratified random sampling and a mixed-methods approach with triangulation of findings, minimizing selection bias and enhancing the study's internal credibility. Finally, external validity, which refers to the generalizability of findings to other contexts, was acknowledged as potentially limited due to the study's focus on Adama City.

However, the utilization of established theoretical frameworks and a well-defined methodology allows for potential application to similar contexts with comparable public procurement practices and road infrastructure development approaches.

In conclusion, the mixed-methods approach, coupled with the chosen sampling techniques and data analysis methods, strengthens the research design and contributes to a robust and comprehensive exploration of the nexus between public procurement management maturity and sustainable performance in Adama City's road infrastructure development projects. Figure 3.2 depicts the overall research methodology flow chart.

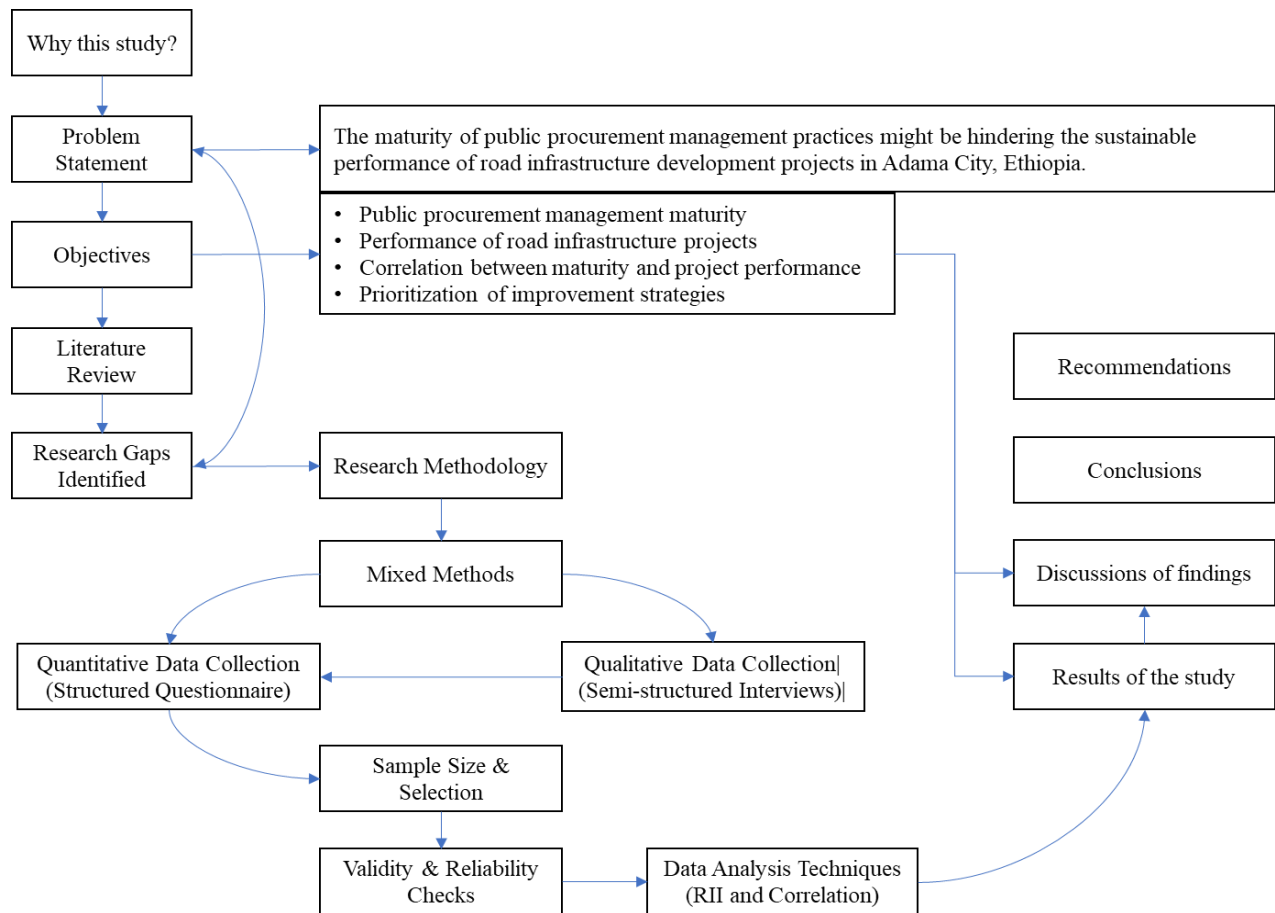


Figure 3.2 Research methodology flow

3.4 Population of the Study

The study delineates its primary focus on a collective of 122 professionals who are integrally involved in the orchestration of road infrastructure projects within the confines of Adama city.

This assemblage is comprised of a diverse array of experts drawn from various sectors that are pivotal to the project's lifecycle. Specifically, the population encompasses:

- 81 professionals from the Client/Municipality: This subgroup represents the governmental echelon that spearheads the initiation, procurement, and overarching management of the road infrastructure projects.
- 22 professionals from the Regulatory Body: Constituting the majority of the population, these individuals are tasked with the enforcement of standards and regulations, ensuring that the projects adhere to the stipulated guidelines and quality benchmarks.
- 9 professionals from contracting firms: These practitioners are on the frontline of the physical construction process, translating plans and blueprints into tangible infrastructure.
- 10 professionals from consulting agencies: Offering specialized knowledge and strategic oversight, consultants play a crucial role in guiding the project towards its successful completion.

Each segment of this population has been meticulously selected to provide a comprehensive overview of the multifaceted nature of road infrastructure development projects. The inclusion of various stakeholders, ranging from policymakers to implementers, ensures a holistic analysis of the relationship between procurement management maturity and the resultant efficacy and sustainability of the infrastructure developed.

3.5 Sample Size Determination

The determination of the sample size is a pivotal aspect of the research methodology, as it directly influences the reliability and validity of the study's findings. To ascertain an appropriate sample size, the study employs Yamane's formula, a widely recognized statistical tool that balances precision with practicality. The formula is delineated as follows:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

- (n) represents the sample size to be determined,
- (N) denotes the total population size, which, in this context, is **122 professionals**,

- (e) signifies the level of precision, which is conventionally set at **0.05** for a 95% confidence level.

Upon the application of the aforementioned values into Yamane’s formula, the calculation proceeds thusly:

$$n = \frac{122}{1 + 122(0.05^2)}$$

$$n = \frac{122}{1 + 122(0.0025)}$$

$$n = \frac{122}{1 + 0.425}$$

$$n = \frac{122}{1.425}$$

$$n = 93.49$$

Given that the sample size cannot encompass a fractional individual, it is rounded to the nearest whole number, yielding a sample size of **94**. This figure represents a statistically significant subset of the total population, ensuring that the study’s conclusions are reflective of the broader community of professionals engaged in road infrastructure projects within Adama city. The precision level of 0.05 is indicative of a 95% confidence interval, suggesting that if the study were to be replicated multiple times, the results would be consistent 95% of the time.

3.6 Sampling Techniques

The study employed a stratified random sampling approach to ensure that each subgroup within the population was proportionately represented in the final sample (94 professionals). This method was chosen due to the diverse and specialized nature of the population involved in Adama city’s road infrastructure projects. Stratification was based on the professional affiliation of the individuals:

- Client/Municipality Professionals (#66): These individuals, at the helm of project initiation and management, provided insights into the governmental perspective of procurement processes.
- Regulatory Body Professionals (#17): This larger stratum was crucial for understanding the enforcement of standards and adherence to regulatory frameworks.
- Contracting Firm Professionals (#7): These participants offered a ground-level view of the construction process and its alignment with procurement management.
- Consulting Agency Professionals (#8): Consultants contributed specialized knowledge and strategic guidance, which was vital for evaluating the maturity of procurement management.

The sample size was calculated using Yamane's formula to achieve a 95% confidence level with a 5% margin of error. A stratified sample was then drawn using random selection within each stratum. This ensured that every individual had an equal chance of being included in the study, enhancing the representativeness of the sample and, consequently, the generalizability of the study's findings.

The allocation of the sample size across the different strata was proportional to their presence in the total population. This ensured that each group's voice was adequately heard and contributed to a comprehensive analysis of the relationship between procurement management maturity and the effectiveness and sustainability of road infrastructure development projects in Ethiopia.

Prior to initiating data collection, the research team prepared a detailed sampling frame that listed all members of the population according to their respective strata. This frame served as the basis for the random selection process and was constructed with meticulous attention to detail to uphold the integrity of the sampling technique. By employing the stratified random sampling method, combined with the calculated sample size and the precision level, the study was positioned to yield insightful and reliable data that would significantly contribute to the body of knowledge on procurement management maturity in the context of road infrastructure development.

3.7 Sources of the Data

This study employed a mixed-methods approach, utilizing both primary and secondary data sources to explore the relationship between public procurement management maturity and the sustainable performance of road infrastructure projects in Adama City.

3.7.1 Primary Data

The primary data for this research was collected through two instruments such as questionnaire survey and semi-structured interviews. A self-administered questionnaire was developed to gather data from a sample of 94 professionals involved in road infrastructure projects within Adama City. The questionnaire addressed the research objectives by assessing public procurement management maturity, evaluating the sustainable performance of road projects, and exploring the link between these factors. The questionnaire was divided into four sections, covering general respondent information, public procurement maturity assessment, sustainable performance evaluation, and strategies for improvement. Stratified random sampling was employed to ensure representation from all stakeholder groups (client/municipalities, regulatory bodies, contractors, and consulting firms). Data analysis involved descriptive and inferential statistics to identify patterns and relationships.

In-depth interviews were conducted with eight purposefully selected participants representing each stakeholder group (client/municipality, regulatory body, contractors, and consulting firms). The interviews aimed to refine questionnaire findings, explore specific aspects in more detail, and potentially identify unforeseen variables influencing the research focus. A semi-structured interview guide facilitated consistency while allowing flexibility to delve into emerging themes. Interviews were audio-recorded, transcribed verbatim, and analyzed using a coding approach to identify patterns and insights that complemented the questionnaire data.

3.7.2 Secondary Data

Secondary data sources provided background information and existing knowledge relevant to the research topic. These sources included academic journals, books, government reports, conference proceedings, and industry publications.

Scholarly publications on public procurement management, sustainable infrastructure development, and related fields provided theoretical frameworks and existing research findings that informed the research design and data analysis. Official reports and policies issued by relevant government agencies in Ethiopia, particularly those concerning public procurement practices and road infrastructure development strategies, offered context and insights into the local regulations and practices. In addition, relevant presentations and publications from conferences and industry organizations on public procurement and sustainable infrastructure development practices offered contemporary perspectives and practical applications that informed the research approach.

In general, the combination of primary and secondary data sources provided a comprehensive understanding of the research topic, allowing for the triangulation of findings and a more robust analysis of the relationship between public procurement management maturity and sustainable performance in Adama City's road infrastructure projects.

3.8 Data Collection Instruments

The data collection for this study employed a mixed-methods approach, utilizing both a questionnaire survey and semi-structured interviews. This section details the development and implementation of the questionnaire survey instrument.

3.8.1 Questionnaire Survey

A questionnaire survey was designed to gather data from a sample of professionals involved in road infrastructure development projects within Adama City. The questionnaire was developed based on the following key considerations:

- The research objectives of the study, particularly to assess the level of public procurement management maturity, evaluate the sustainable performance of road projects, and explore the relationship between these factors.
- The need to capture data from a diverse range of stakeholders, including representatives from client/municipalities, regulatory bodies, contractors, and consulting firms.
- The importance of ensuring clarity, comprehensiveness, and ease of use for respondents.

The questionnaire was divided into four main sections:

Section 1: General Information about the Respondents: This section collected basic demographic data about the respondents, including their educational background, current organization, job title, and years of experience in the construction industry. This information helped to establish the credibility of the respondents and ensure the data collected reflected the perspectives of relevant stakeholders.

Section 2: Public Procurement Management Maturity Level Assessment: This section aimed to assess the current state of public procurement practices within the respondents' organizations. It presented a series of statements regarding various public procurement maturity criteria. Respondents were asked to rate the extent to which each statement reflected the practices within their organization using a Likert scale ranging from "Strongly Disagree" to "Strongly Agree." This data enabled the evaluation of the level of public procurement management maturity in Adama City's road infrastructure projects.

Section 3: Sustainable Performance of Road Infrastructure Development Projects: This section focused on the respondents' experience with recent road infrastructure projects in Adama City. It presented statements related to the project's effectiveness and sustainability across various dimensions. Respondents were asked to rate their level of agreement with each statement using a similar Likert scale. This data facilitated the assessment of the sustainable performance of road projects in the city.

Section 4: Strategies for Improving Public Procurement Management Maturity: The final section explored potential strategies for enhancing public procurement management maturity. It presented a series of statements outlining different management approaches. Respondents were asked to rate their level of agreement with each statement using a Likert scale. This data aided in identifying and prioritizing strategies for improving public procurement practices in Adama City.

The questionnaire was piloted with a small group of construction professionals to ensure its clarity, comprehensiveness, and ease of understanding. Based on the pilot test feedback, minor revisions were made to the wording and formatting of some questions.

The final questionnaire was administered in person to a sample of 94 professionals, with an additional 10% buffer to account for potential missing surveys. The sample size was calculated

using Yamane's formula to achieve a 95% confidence level with a 5% margin of error. Stratified random sampling was employed to ensure that all stakeholder groups were adequately represented in the sample.

The questionnaire survey yielded valuable data that provided insights into the current state of public procurement management practices, the sustainability performance of road infrastructure projects, and potential strategies for improvement in Adama City. The data from the questionnaire survey was analyzed using descriptive statistics and inferential statistical techniques to identify patterns, relationships, and differences between variables. The findings from the questionnaire survey, along with the data collected through the semi-structured interviews (presented in the following section), will be presented and discussed in Chapter 4.

3.8.2 Interviews

In addition to the questionnaire survey, a series of semi-structured interviews were conducted to delve deeper into the relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City. These interviews served a threefold purpose. First, they aimed to refine the findings from the questionnaire. While the survey provided a general overview, interviews allowed for a more nuanced understanding by exploring specific aspects of the responses and uncovering context-dependent details. Second, the interviews facilitated the identification of additional variables that might influence the relationship between procurement maturity and project sustainability. While the questionnaire focused on pre-determined themes, the unstructured nature of interviews allowed for the emergence of unforeseen factors or trends. Finally, interviews provided a platform to capture the experiences and perspectives of participants in their own words. This qualitative data offered a richer understanding of the research topic compared to the structured format of a questionnaire.

A purposive sampling approach was employed to select eight interview participants, ensuring the inclusion of individuals with specific knowledge and experience relevant to the research objectives. Two participants were chosen from each of the following stakeholder groups: client/municipality, regulatory body, contractors, and consulting firms. This selection ensured a well-rounded perspective by capturing insights from those directly involved in different stages of project development and implementation.

A semi-structured interview guide was developed to maintain consistency while allowing for flexibility in exploring emerging themes. The guide covered key areas such as public procurement management practices, the sustainable performance of road projects, the nexus between procurement and sustainability, and strategies for improvement. The interview guide was piloted with a colleague to ensure clarity, comprehensiveness, and the logical flow of questions, with minor adjustments made based on the pilot feedback.

The semi-structured interviews were conducted face-to-face in locations convenient for the participants. Informed consent was obtained before commencing each interview. Each interview lasted approximately 45-60 minutes and was audio-recorded with the participant's permission. The recordings were transcribed verbatim to facilitate thematic analysis using a coding approach. Codes were developed based on the interview guide and emerging themes from the transcripts. The coded data was then categorized and analyzed to identify patterns, relationships, and insights that complemented and expanded upon the findings from the questionnaire survey.

By employing a mixed-methods approach that combined the quantitative data from the questionnaire survey with the rich qualitative data from the semi-structured interviews, this study was able to gain a comprehensive understanding of the nexus between public procurement management maturity and sustainable performance of road infrastructure development projects in Adama City. The combined findings will be presented and discussed in Chapter 4.

3.9 Data Analysis Techniques

3.9.1 Relative Importance Index Analysis

This study employed the Relative Importance Index (RII) technique to analyze survey responses collected from construction professionals in Adama City. RII is a non-parametric method particularly suited for evaluating data obtained through Likert-scale questionnaires, which are commonly used in research to measure perceptions and attitudes. It offers a valuable tool for ranking the relative importance of various factors within a specific context (Tola,2024). In this study, Microsoft Excel was utilized to calculate RII for three key sections of the survey data, corresponding to the first, second, and fourth specific objectives.

Objective 1: Ranking Public Procurement Management Maturity Areas

For Objective 1, the RII analysis focused on ranking the different maturity areas employed to evaluate the public sector client's public procurement management maturity in delivering road infrastructure projects. This ranking process helped identify the strengths and weaknesses in their current practices. The RII calculation considered the weights assigned by respondents to each maturity area, highlighting those deemed most critical for effective procurement. Results from the RII analysis guided the identification of areas requiring improvement, such as reviewing policies for ethical conduct and corruption prevention, assessing procurement cycle times, and examining department integration, alongside the confirmed strengths like aligning procurement strategy with city goals and integrating procurement plans.

Objective 2: Ranking Sustainable Performance Measures

Similarly, the RII analysis played a crucial role in Objective 2 by ranking various sustainable performance measures for road infrastructure development projects. This ranking process enabled the pinpointing of areas where project performance excelled or fell short in terms of sustainability. The RII calculation incorporated the weights provided by respondents for each performance measure, revealing the most critical factors influencing the overall sustainability of projects. Through this analysis, weaknesses were identified in design alignment with project goals, ongoing infrastructure maintenance, and user safety. Conversely, the RII analysis highlighted strengths in areas like usability, movement improvement, resilience, and economic influence.

Objective 4: Prioritization of Management Strategies

For Objective 4, the RII analysis shifted its focus to prioritizing potential management strategies for enhancing public procurement management maturity. This objective aimed to identify the most impactful strategies for improvement based on the respondents' perspectives. The RII calculation considered the weights assigned to each strategy, revealing those perceived as most effective in driving maturity. This analysis provided valuable insights, recommending the prioritization of strategies like outlining a clear vision, setting standards and procedures, and promoting transparency and accountability. Establishing a dedicated procurement unit and implementing a performance measurement system were also identified as high-impact improvements based on the RII analysis.

In conclusion, the RII analysis proved to be a robust and valuable technique for analyzing the survey data across all three objectives. By providing rankings and highlighting strengths and weaknesses, the RII analysis offered a clear understanding of critical areas for improvement and prioritized potential management strategies, ultimately contributing to the success of the overall study.

3.9.2 Pearson Product Moment Correlation Analysis

To achieve the research objectives, this study employed a two-pronged data analysis approach. For the first, second, and fourth objectives, which aimed to assess the level of public procurement management maturity, evaluate sustainable performance, and prioritize improvement strategies, the RII technique was utilized (See Section 3.8.1).

However, to address the third objective, which explored the correlational relationship between public procurement management maturity and sustainable performance, a different statistical method was employed. SPSS Version 27 software was used to conduct a Pearson Moment Product Correlation analysis. This analysis technique measures the strength and direction of the linear relationship between two continuous variables. In this case, the variables were the level of public procurement management maturity and the sustainable performance of road infrastructure development projects.

The Pearson correlation coefficient (r) provides a value between -1 and +1, where -1 indicates a perfect negative correlation, +1 indicates a perfect positive correlation, and 0 signifies no correlation. The closer the coefficient is to either extreme, the stronger the relationship between the variables. The direction of the correlation (positive or negative) reflects whether higher levels of one variable are associated with higher or lower levels of the other variable.

3.10 Reliability of the Data

To ensure the reliability and internal consistency of the data collected through the questionnaire survey, Cronbach's alpha coefficient was employed. This widely used statistical test evaluates the extent to which the various items within each section of the questionnaire measure the same underlying construct. In simpler terms, it assesses whether the questions within a section are all capturing the same information or concept.

Cronbach's alpha is calculated using the following formula:

$$\alpha = (k / (k - 1)) * (1 - \Sigma\sigma^2i / \sigma^2t)$$

where:

- α = Cronbach's alpha coefficient (ranging from 0 to 1)
- k = number of items in the questionnaire section
- $\Sigma\sigma^2i$ = sum of the variances of each individual item
- σ^2t = total variance of the sum of scores for all items

Cronbach's alpha is calculated using a specific formula that considers the number of items in the questionnaire section (k), the individual variances of each item ($\Sigma\sigma^2i$), and the total variance of the sum of scores for all items (σ^2t). The resulting alpha coefficient (α) ranges from 0 to 1, with higher values indicating greater internal consistency.

In this study, Cronbach's alpha was calculated for each section of the questionnaire. All sections achieved a Cronbach's alpha value greater than 0.7, which is generally considered a benchmark for acceptable internal consistency. This result provides strong evidence that the data collected through the questionnaire is reliable and provides a consistent measure of perceptions and experiences related to public procurement management and construction of public road infrastructure development projects in Adama City.

3.11 Validity of the Study

This section examines the validity of the data collection and analysis methods employed in this study to ensure the trustworthiness and credibility of the findings. The focus will be on three key aspects of validity: construct validity, internal validity, and external validity.

3.11.1 Construct Validity

Construct validity refers to the degree to which the data accurately measures the intended concepts. In this study, the questionnaires and interview guides were meticulously designed to capture the relevant constructs of public procurement management maturity and sustainable performance of road infrastructure projects. The content was based on existing literature and piloted with a small group to ensure clarity and comprehensiveness. This process strengthens the construct validity by minimizing the risk of measuring irrelevant aspects or misinterpreting responses.

3.11.2 Internal Validity

Internal validity pertains to the extent to which the study design minimizes threats that could lead to misleading conclusions about the cause-and-effect relationships. The stratified random sampling method employed in this study helps ensure representativeness of the data and reduces selection bias. Additionally, the use of a mixed-methods approach with both questionnaires and semi-structured interviews allows for triangulation of findings, enhancing the internal validity by providing a more complete picture and minimizing the risk of drawing conclusions based on a single data source.

3.11.3 External Validity

External validity addresses the generalizability of the study's findings to other contexts. While the study focuses on road infrastructure projects in Adama City, Ethiopia, the utilization of established theoretical frameworks and a well-defined methodology allows for potential generalizability to similar contexts with comparable public procurement practices and road infrastructure development approaches. However, acknowledging the specific context of the study is crucial when discussing the external validity and potential limitations in generalizing the findings to other settings.

In conclusion, the research design and data collection methods employed in this study were carefully chosen to ensure the validity of the findings. The focus on construct validity, internal validity, and external validity strengthens the credibility of the research and allows for drawing reliable conclusions about the relationship between public procurement management maturity and sustainable performance of road infrastructure development projects.

3.12 Ethical Considerations

The study followed the ethical principles and guidelines of the Addis College and the Adama City Administration. The study obtained the necessary permissions and approvals from the relevant authorities and institutions before conducting the data collection. The study also ensured the confidentiality, anonymity, and informed consent of the participants and respect their rights and dignity. Moreover, the study acknowledged the sources of data and avoid plagiarism and falsification.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the key findings of the study which explored the nexus between public procurement management maturity and the sustainable performance of road infrastructure development projects in Adama City. The chapter is divided into five sections. The first section describes the respondent profiles, highlighting the range of perspectives captured through the survey and interviews. The second and third sections analyze the maturity of public procurement management practices and the sustainable performance of road infrastructure projects in Adama City, respectively. The fourth section examines the correlation between these two aspects. Finally, the chapter concludes by presenting and discussing potential management strategies for enhancing public procurement management maturity in Adama City.

4.2 Respondent Profiles

To gain a comprehensive understanding of the nexus between public procurement management maturity and sustainable performance of road infrastructure development projects in Adama City, data collection employed a mixed-methods approach. This approach utilized a questionnaire survey distributed to a sample of 94 individuals, with an additional 10% buffer to account for potential missing surveys. The final analysis considered only the 94 complete responses. In addition to the survey, interviews were conducted with a subset of respondents for deeper insights. This section presents a detailed profile of the survey respondents, providing a comprehensive picture of their backgrounds and expertise relevant to the study.

By examining these various aspects of the respondent profiles, the study ensures the data collected reflects the diverse perspectives of stakeholders involved in road infrastructure development projects. This rich data set strengthens the credibility of the findings and allows for a more nuanced understanding of the interplay between public procurement practices and project sustainability in Adama City.

4.2.1 Respondent’s Respective Organizations

To gain a well-rounded understanding of the nexus between public procurement management maturity and sustainable performance of road infrastructure development projects in Adama City, data was collected from a diverse range of respondents representing various organizations within the construction industry (Table 4.1).

Table 4.1 Respondent’s respective organizations

Respective Organization	Frequency	Percent
Regulatory Body	17	18
Client/Municipality	62	66
Contractors	7	7
Consultants	8	9
Total	94	100.0

The survey was distributed to individuals from four primary sectors: regulatory bodies, client/municipalities, contractors, and consultants. With 17 responses (18%), regulatory bodies comprised the smallest portion of the respondents (Table 4.1). The largest group of respondents were client/municipality representatives, constituting 66% (62responses) of the sample (Table 4.1). Contractors and consultants made up the remaining 16% of respondents, with 7 (7%) and 8 (9%) responses respectively (Table 4.1).

This distribution of respondents ensures that the data collected reflects the perspectives of various stakeholders involved in road infrastructure development projects in Adama City. Inclusion of representatives from regulatory bodies allows for insights into the standards and oversight that govern public procurement practices. Client/municipality perspectives are crucial as they are the entities responsible for initiating and managing these projects. Data from contractors provides information on the practical challenges and considerations encountered during project execution. Finally, consultant insights offer valuable expertise regarding technical aspects and best practices within the industry.

By collecting data from such a diverse range of respondents, the study is able to capture a comprehensive picture of public procurement management practices and their influence on the

sustainable performance of road infrastructure projects in Adama City. This rich data set will contribute to a more nuanced understanding of the interplay between these factors and will ultimately inform the development of targeted strategies to enhance both procurement management maturity and project sustainability.

4.2.2 Respondent’s Job Position

The respondents’ job positions were spread across various disciplines within the construction industry, reflecting the multifaceted nature of road infrastructure development projects (Table 4.2).

Table 4.2 Respondent’s job position

Job Position	Frequency	Percent
Office Engineer	79	84
Site Engineer	4	4
Project Manager	3	3
Resident Engineer	8	9
Total	94	100.0

The majority of respondents, at 84% (79 individuals), were employed as office engineers. This suggests that the survey reached a broad range of professionals directly involved in the day-to-day tasks and technical aspects of these projects. A smaller percentage of respondents held positions as site engineers (4%), project managers (3%), and resident engineers (9%). These roles encompass a wider scope of responsibilities, overseeing various phases of project execution and providing strategic management (Table 4.2).

The distribution of job positions among respondents ensures that the data collected offers insights from individuals with a range of technical and managerial expertise within the construction industry. Having a high proportion of office engineers included in the survey strengthens the understanding of common practices and challenges encountered during project implementation. Input from project managers and resident engineers provides a complementary perspective on the overall planning and execution of road infrastructure development projects.

By capturing the viewpoints of professionals from various job positions, the study is able to provide a well-rounded picture of public procurement management practices and their influence

on the sustainable performance of road infrastructure projects in Adama City. This comprehensive data set will contribute to a more nuanced understanding of how construction professionals approach public procurement and its impact on project delivery.

4.2.3 Respondent’s Educational Background

In addition to organizational affiliation and job titles, understanding the educational background of our respondents provides valuable insight. This information, presented in the table below (Table 4.3), sheds light on the knowledge base that shapes road maintenance practices in Adama City. By exploring the educational landscape, we can gain a deeper appreciation for the expertise brought to the table by each respondent.

The educational background of the respondents possessed a variety of degrees relevant to the construction industry (Table 4.3).

Table 4.3 Respondent’s educational background

Education Level	Frequency	Percent
College Diploma	11	12
BSc	54	57
MSc	28	30
Ph.D.	1	1
Total	94	100.0

All respondents (100%) held at least a college diploma. The largest proportion of respondents, at 57%, reported having a Bachelor’s degree. This was followed by Master’s degrees (30%) and PhDs (1%) (Table 4.3). The high percentage of respondents with college degrees or higher reflects the specialized knowledge and skills required for successful participation in road infrastructure development projects.

Given the focus of the study on public procurement management, it is important to note that the specific educational backgrounds of the respondents are not directly addressed in Table 4.3. However, the fact that all respondents possess college diplomas or higher suggests a strong foundation in core construction industry disciplines. Further analysis could be conducted in future

studies to explore the potential correlation between specific educational backgrounds and understanding of public procurement practices.

This range of educational backgrounds ensures that the data collected reflects the knowledge and expertise of qualified professionals working within the Adama City construction industry. The inclusion of respondents with a variety of academic qualifications strengthens the credibility of the findings. Future research could delve deeper into exploring how specific educational programs equip professionals with the knowledge and skills necessary to navigate the complexities of public procurement management.

4.2.4 Respondent’s Experience

The respondents’ experience in the construction industry ranged from less than five years to over 14 years (Table 4.4).

Table 4.4 Respondent’s year of experience

Year of experience	Frequency	Percent
< 5 years	21	22
5 - 9 years	35	37
10 - 14 years	24	26
> 14 years	14	15
Total	94	100.0

The largest proportion of respondents, at 37%, had between 5 and 9 years of experience. This is followed by those with 10 to 14 years of experience (26%), less than 5 years of experience (22%), and over 14 years of experience (15%) (Table 4.4). This distribution of experience levels ensures that the data collected incorporates the perspectives of a variety of professionals at different stages of their careers in the construction industry.

Having a range of experience levels among respondents strengthens the comprehensiveness of the data collected (Table 4.4). Those with less experience can offer insights into recent industry trends and approaches to public procurement. In contrast, more experienced professionals can provide valuable perspectives on established practices and long-term considerations for sustainable infrastructure development.

By capturing the experience of professionals at various stages of their careers, the study is able to provide a more nuanced understanding of public procurement management practices and their influence on the sustainable performance of road infrastructure projects in Adama City. This data set will inform the development of future strategies that improve public procurement maturity and contribute to the sustainable development of road infrastructure projects in the city.

4.3 Assessment of Public Procurement Management Maturity in Road Infrastructure Development

This section explores into a crucial aspect of the study: evaluating the current level of public procurement management maturity within Adama City Administration for delivering road infrastructure development projects. To achieve this objective, we employed the Relative Importance Index (RII) analysis technique. This approach allowed us to assess various practice areas considered essential for effective public procurement management. The subsequent table presents the RII scores for each practice area, along with their corresponding rankings (Table 4.5). By analyzing these results, we can gain valuable insights into the strengths and weaknesses of the current procurement practices employed by Adama City Administration.

Table 4.0.5 RII Scores and rankings of public procurement management practice areas

Area of public procurement management practices	RII Scores	Rank
1. Alignment of procurement strategy with organizational objectives and road infrastructure development goals.	0.79	1
2. Integration of procurement plans with other strategic plans, considering risk, quality, and budget.	0.78	2
3. Analysis of the procurement system's ability to adapt to new performance metrics and KPIs.	0.65	3
4. Monitoring and evaluation of procurement performance using key performance indicators (KPIs).	0.59	4
5. Ethical practices, integrity, transparency, accountability, and fairness in procurement.	0.57	5

6. Analysis of the alignment between staff competencies and the strategic needs of procurement projects.	0.56	6
7. Efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools.	0.55	7
8. Structure and roles within the procurement department, including a dedicated team for managing road infrastructure projects.	0.54	8
9. Evaluation of the effectiveness of professional development programs in keeping pace with industry changes.	0.54	8
10. Competence and skills of procurement staff, with provision for continuous training and development.	0.53	10
11. Regular reviews, audits, and feedback mechanisms for continuous improvement.	0.53	11
12. A workforce with the necessary expertise in procurement management.	0.51	12
13. Use of performance metrics to track efficiency, cost savings, and project delivery timelines.	0.51	13
14. Development of comprehensive and individual project procurement plans, outlining objectives, timelines, budget, and risk strategies.	0.50	14
15. Benchmarking procurement performance against industry standards and best practices.	0.50	15
16. Consideration of sustainability, social responsibility, and environmental factors in procurement decisions.	0.49	16
17. Evaluation of the procurement strategy's responsiveness to changes in organizational objectives and market conditions.	0.49	17
18. Assessment of the strategic procurement decision-making process and its alignment with long-term infrastructure goals.	0.48	18
19. Encouragement and adoption of innovative procurement methods, tools, and techniques.	0.48	19

20. Defined processes for supplier selection, evaluation, and relationship management.	0.47	20
21. Clearly defined and communicated roles and responsibilities, with support from leadership for procurement initiatives.	0.47	21
22. Evaluation of the effectiveness of the decision-making hierarchy within the procurement function.	0.47	21
23. Review of the procurement department's approach to innovation and its impact on process efficiency.	0.45	23
24. Assessment of the impact of procurement activities on local communities and the environment.	0.44	24
25. Succession planning, talent retention, and a culture of continuous learning and improvement.	0.43	25
26. Examination of the procurement department's integration with other departments to achieve organizational synergy.	0.42	26
27. Assessment of the procurement cycle time and its impact on project timelines.	0.40	27
28. Review of the procurement policies' effectiveness in promoting ethical behavior and preventing corruption.	0.38	28

The analysis of RII scores and rankings presented in Table 4.5 revealed key areas for improvement in public procurement management practices within Adama City Administration for delivering road infrastructure development projects. The areas with the lowest rankings, indicating the most significant room for improvement, were: review of the procurement policies' effectiveness in promoting ethical behavior and preventing corruption (Rank 28, RII score 0.38), assessment of the procurement cycle time and its impact on project timelines (Rank 27, RII score 0.40), and examination of the procurement department's integration with other departments to achieve organizational synergy (Rank 26, RII score 0.42).

These findings suggest potential weaknesses in the current procurement policies that may not adequately address ethical conduct and corruption prevention. Additionally, the procurement

process itself may be experiencing inefficiencies that lead to extended project timelines. Finally, a lack of integration between the procurement department and other relevant departments within the administration could be hindering overall efficiency and collaboration. Addressing these areas will be crucial in enhancing the maturity level of public procurement management practices for road infrastructure development projects in Adama City Administration.

Following the 28th to 26th ranked areas, the analysis of RII scores and rankings continues to reveal opportunities for improvement in Adama City Administration's public procurement management practices for road infrastructure development projects. The 25th ranked area, succession planning, talent retention, and a culture of continuous learning and improvement (RII score 0.43), suggests a potential need to solidify future workforce development. This could involve establishing a defined plan for identifying and nurturing future procurement leaders, alongside fostering a culture of continuous learning through professional development and training programs.

The 24th ranked area, assessment of the impact of procurement activities on local communities and the environment (RII score 0.44), highlights a potential gap in considering these factors during the procurement process. To address this, the administration could implement clear guidelines for assessing and mitigating environmental and social impacts, while also strengthening its capacity to monitor contractor performance in these areas. Integrating social and environmental considerations into procurement practices can contribute to sustainable development for road infrastructure projects.

The 23rd ranked area, review of the procurement department's approach to innovation and its impact on process efficiency (RII score 0.45), indicates a need for exploring and implementing innovative methods. Addressing this could involve fostering a more receptive culture towards new approaches, allocating resources for innovation initiatives, and raising awareness of how innovative procurement practices can enhance efficiency in delivering road projects. By focusing on these aspects, Adama City Administration can work towards a more robust and forward-thinking public procurement management system for its road infrastructure development endeavors.

Examining the opposite end of the spectrum, the analysis of RII scores unveils strengths within Adama City Administration's public procurement management practices for road infrastructure projects. The highest ranked area, alignment of procurement strategy with organizational

objectives and road infrastructure development goals (Rank 1, RII Score 0.79), signifies a strong correlation between procurement activities and the administration's overarching objectives. This indicates a well-defined procurement strategy that directly supports the achievement of desired outcomes in road infrastructure development.

Furthermore, the second-highest ranked area, integration of procurement plans with other strategic plans, considering risk, quality, and budget (Rank 2, RII Score 0.78), highlights a strength in how procurement planning is conducted. This suggests a commendable approach that incorporates factors like risk, quality, and budget during the planning stages. This integrated perspective ensures that procurement activities are aligned with broader organizational goals and contribute to the successful execution of projects.

Finally, the relatively high ranking for analysis of the procurement system's ability to adapt to new performance metrics and KPIs (Rank 3, RII Score 0.65) indicates a strength in the system's adaptability. This suggests that the administration possesses the capability to evolve its procurement practices to accommodate changing priorities and performance measurement considerations. This adaptability is crucial for ensuring the system's continued effectiveness in supporting the achievement of organizational goals over time. These top three rankings demonstrate a strong foundation for Adama City Administration's public procurement management practices.

4.4 Evaluation of Sustainable Performance of Road Infrastructure Projects

Having assessed the public sector client's public procurement management maturity in the first specific objective, we now shift our focus to the sustainable performance of road infrastructure development projects within the Adama City Administration. This evaluation employed the RII analysis technique to identify the most critical performance indicators from a sustainability perspective. The RII scores and corresponding rankings for these indicators are presented in the Table 4.6. This analysis forms a crucial step in understanding the current strengths and weaknesses of Adama's road development projects regarding sustainability.

Table 4.0.6 RII scores and rankings of sustainable performance measures

Sustainable Performance Measures	RII Scores	Rank
1. The extent to which the infrastructure is usable by all intended users.	0.85	1
2. Improvement in the movement of people and goods.	0.84	2
3. Ability to withstand and recover from adverse conditions.	0.83	3
4. Influence on local and regional economic development.	0.78	4
5. Efficiency and timeliness of project execution.	0.65	5
6. Comprehensive and realistic project planning.	0.62	6
7. Adequacy and stability of funding sources.	0.61	7
8. Effects on community well-being and social structures.	0.59	8
9. Assessment of multiple aspects to inform decision-making.	0.58	9
10. Economic feasibility for users and stakeholders.	0.58	9
11. Involvement of all relevant parties in decision-making processes.	0.58	11
12. Fair distribution of infrastructure benefits among different social groups.	0.55	12
13. Consequences for natural ecosystems and biodiversity.	0.54	13
14. Comparison of project costs against benefits.	0.53	14
15. Evaluation of environmental impacts throughout the project's life cycle.	0.46	15
16. Minimization of environmental pollution.	0.42	16
17. Reduction in accidents and enhancement of user security.	0.41	17
18. Ongoing upkeep and preservation of infrastructure.	0.38	18
19. Appropriateness of design to meet project goals.	0.37	19

The analysis of the RII scores and rankings presented in Table 4.6 revealed that three performance measures consistently ranked amongst the lowest, highlighting potential areas for significant improvement in the sustainability of road infrastructure development projects. These were: appropriateness of design to meet project goals (Rank 19, RII score: 0.37), ongoing upkeep and preservation of infrastructure (Rank 18, RII score: 0.38), and reduction in accidents and enhancement of user security (Rank 17, RII score: 0.41).

A low RII score of 0.37 for "appropriateness of design to meet project goals" suggests a concerning misalignment between project goals and the actual designs implemented. This could stem from unclear project goals at the outset, or a failure to integrate sustainability considerations throughout the design phase. The low RII score of 0.38 for "ongoing upkeep and preservation of infrastructure" indicates deficiencies in how well the constructed infrastructure is maintained. This can lead to premature road deterioration and safety hazards arising from neglected maintenance. Finally, the RII score of 0.41 for "reduction in accidents and enhancement of user security" signifies that the current projects are not adequately prioritizing user safety. This could be attributed to poor road design itself, or a lack of crucial safety features like signage and guardrails.

These findings underscore the need for focused discussions on how to enhance the sustainability of road infrastructure development projects. By directing efforts towards improving design alignment with project goals, ensuring proper maintenance practices, and prioritizing user safety through better design and implementation of safety features, project managers can make significant strides towards achieving more sustainable road infrastructure development.

Continuing down the rankings, the 16th and 15th placed performance measures, "minimization of environmental pollution" (Rank 16, RII score: 0.42) and "evaluation of environmental impacts throughout the project's life cycle" (Rank 15, RII score: 0.46), further emphasize aspects requiring improvement for sustainable road infrastructure development.

A low RII score of 0.42 for "minimization of environmental pollution" indicates insufficient measures to curb pollution during road project lifespans. This could be due to factors like dust generation during construction or emissions from vehicles using the completed roads. The RII score of 0.46 for "evaluation of environmental impacts throughout the project's life cycle" suggests a critical gap in comprehensively assessing environmental impact across all project phases. This encompasses not only the construction stage but also the road's usage and maintenance throughout

its lifespan. These findings highlight the importance of implementing strategies to minimize environmental pollution and conducting thorough environmental impact assessments across the entire project life cycle. By addressing these aspects, project managers can make significant contributions towards achieving sustainable road infrastructure development.

Conversely, examining the higher rankings within the RII scores reveals strengths in four key areas of sustainable road infrastructure development projects: usability (Rank 1, RII score: 0.85), movement improvement (Rank 2, RII score: 0.84), resilience (Rank 3, RII score: 0.83), and economic influence (Rank 4, RII score: 0.78).

A high RII score of 0.85 for "the extent to which the infrastructure is usable by all intended users" signifies a commendable focus on inclusive design, ensuring accessibility for all user groups including people with disabilities, cyclists, pedestrians, and public transportation users. The high RII score of 0.84 for "improvement in the movement of people and goods" indicates effectiveness in achieving improved flow of people and goods. This can be measured through factors like reduced travel times, lower congestion levels, and enhanced safety.

Ranking third with an RII score of 0.83, "ability to withstand and recover from adverse conditions" suggests that the projects are demonstrably resilient against challenges like extreme weather events or natural disasters. Finally, the RII score of 0.78 for "influence on local and regional economic development" highlights a positive impact on the economic growth of the surrounding areas. This positive influence can be measured by factors such as increased job creation, boosted business activity, and rising property values.

These strengths provide a valuable foundation for future road infrastructure development projects. By acknowledging these successes while simultaneously addressing the identified weaknesses, project managers can strive for continuous improvement towards achieving sustainable, equitable, and community-enriching road infrastructure.

4.5 Analysis of the Correlation Between Procurement Management Maturity and Sustainable Performance

The third objective of this study was to examine the correlational relationship between public procurement management maturity and the sustainable performance of road infrastructure development projects. Pearson Moment Product Correlation analysis was used to assess the

strength and direction of the relationships between the two variables. The results of this analysis are presented in Table 4.7.

Table 4.0.7 Correlation matrix between public procurement management maturity and sustainable performance indicators

Public procurement management maturity criteria	Sustainable Performance	Significance Level
1. Alignment of procurement strategy with organizational objectives and road infrastructure development goals.	0.033	Not Significant
2. Integration of procurement plans with other strategic plans, considering risk, quality, and budget.	.499**	Significant at 0.05 level
3. Analysis of the procurement system's ability to adapt to new performance metrics and KPIs.	.370**	Significant at 0.05 level
4. Monitoring and evaluation of procurement performance using key performance indicators (KPIs).	.400**	Significant at 0.05 level
5. Ethical practices, integrity, transparency, accountability, and fairness in procurement.	.413**	Significant at 0.05 level
6. Analysis of the alignment between staff competencies and the strategic needs of procurement projects.	.376**	Significant at 0.05 level
7. Efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools.	.550**	Significant at 0.01 level
8. Structure and roles within the procurement department, including a dedicated team for managing road infrastructure projects.	.338**	Significant at 0.05 level
9. Evaluation of the effectiveness of professional development programs in keeping pace with industry changes.	0.197	Not Significant
10. Competence and skills of procurement staff, with provision for continuous training and development.	.455**	Significant at 0.05 level

11. Regular reviews, audits, and feedback mechanisms for continuous improvement.	.494**	Significant at 0.05 level
12. A workforce with the necessary expertise in procurement management.	.356**	Significant at 0.05 level
13. Use of performance metrics to track efficiency, cost savings, and project delivery timelines.	0.011	Not Significant
14. Development of comprehensive and individual project procurement plans, outlining objectives, timelines, budget, and risk strategies.	0.140	Not Significant
15. Benchmarking procurement performance against industry standards and best practices.	.435**	Significant at 0.05 level
16. Consideration of sustainability, social responsibility, and environmental factors in procurement decisions.	.561**	Significant at 0.01 level
17. Evaluation of the procurement strategy's responsiveness to changes in organizational objectives and market conditions.	.334**	Significant at 0.05 level
18. Assessment of the strategic procurement decision-making process and its alignment with long-term infrastructure goals.	.374**	Significant at 0.05 level
19. Encouragement and adoption of innovative procurement methods, tools, and techniques.	-0.101	Not Significant
20. Defined processes for supplier selection, evaluation, and relationship management.	.291**	Not Significant
21. Clearly defined and communicated roles and responsibilities, with support from leadership for procurement initiatives.	.332**	Significant at 0.05 level
22. Evaluation of the effectiveness of the decision-making hierarchy within the procurement function.	.318**	Significant at 0.05 level
23. Review of the procurement department's approach to innovation and its impact on process efficiency.	.415**	Significant at 0.05 level
24. Assessment of the impact of procurement activities on local communities and the environment.	.462**	Significant at 0.05 level

25. Succession planning, talent retention, and a culture of continuous learning and improvement.	.333**	Significant at 0.05 level
26. Examination of the procurement department's integration with other departments to achieve organizational synergy.	.456**	Significant at 0.05 level
27. Assessment of the procurement cycle time and its impact on project timelines.	0.194	Not Significant
28. Review of the procurement policies' effectiveness in promoting ethical behavior and preventing corruption.	.271**	Significant at 0.05 level

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

**. Correlation is significant at the 0.01 level (2-tailed).

According to Table 4.7, there are statistically significant correlations between public procurement management maturity and several sustainable performance indicators for road infrastructure development projects in Adama City at the 0.05 level (2-tailed) significance level. This means that there is a less than 5% probability that the observed correlation is due to random chance.

However, only two correlations are statistically significant at the 0.01 level (2-tailed), which means there is a less than 1% probability that the observed correlation is due to random chance. These statistically significant correlations are:

- Consideration of sustainability, social responsibility, and environmental factors in procurement decisions (0.561)
- Efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools (0.550)

These findings suggest that public procurement management maturity has a strong positive relationship with these two sustainable performance indicators. In other words, as the maturity of public procurement management practices increases, so too does the consideration of sustainability, social responsibility, and environmental factors in procurement decisions, as well as the efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools. This is likely because more mature public procurement management practices are more likely to be comprehensive and take into account a wider range of factors,

including sustainability considerations. Additionally, more mature public procurement management practices are more likely to be efficient and make use of modern technologies to streamline processes.

Based on the table you provided, there are several other statistically significant correlations at the 0.05 level (2-tailed) significance level, which means there is a less than 5% probability that the observed correlation is due to random chance. These correlations suggest that there is a positive relationship between public procurement management maturity and these sustainable performance indicators, but the relationships are not as strong as the two statistically significant correlations at the 0.01 level (2-tailed) significance level.

Here are some of the other statistically significant correlations at the 0.05 level (2-tailed) significance level:

- Integration of procurement plans with other strategic plans, considering risk, quality, and budget (0.499)
- Monitoring and evaluation of procurement performance using key performance indicators (KPIs) (0.400)
- Ethical practices, integrity, transparency, accountability, and fairness in procurement (0.413)
- Analysis of the alignment between staff competencies and the strategic needs of procurement projects (0.376)
- Competence and skills of procurement staff, with provision for continuous training and development (0.455)
- Regular reviews, audits, and feedback mechanisms for continuous improvement (0.494)
- Benchmarking procurement performance against industry standards and best practices (0.435)
- Assessment of the procurement strategy's responsiveness to changes in organizational objectives and market conditions (0.334)
- Review of the procurement department's approach to innovation and its impact on process efficiency (0.415)
- Assessment of the impact of procurement activities on local communities and the environment (0.462)

- Succession planning, talent retention, and a culture of continuous learning and improvement (0.422)
- Examination of the procurement department's integration with other departments to achieve organizational synergy (0.456)

These findings suggest that public procurement management practices that focus on integrating procurement plans with other strategic plans, ethical practices, a competent and well-trained workforce, continuous improvement, benchmarking, responsiveness to change, innovation, social and environmental responsibility, and collaboration across departments are likely to lead to more sustainable performance in road infrastructure development projects.

4.6 Prioritization of Management Strategies for Enhancing Procurement Management Maturity

The final specific objective of this thesis investigated potential management strategies for enhancing the maturity of public procurement practices within the Adama City Administration. This objective builds upon the findings from the previous sections, which evaluated the current public procurement management maturity and the sustainability performance of road infrastructure projects.

Employing the RII analysis technique, we identified and ranked various management strategies with the potential to improve procurement practices and, consequently, promote more sustainable road development in Adama. The RII scores and corresponding rankings for these strategies are presented in the Table 4.8.

Table 0.8 RII scores and rankings of management strategies

Strategies for Enhancing Public Procurement Management Maturity	RII Scores	Rank
1. Outline vision, mission, values, and stakeholder roles.	0.93	1
2. Set clear rules, standards, and procedures.	0.91	2
3. Promote transparency, accountability, and responsibility.	0.89	3
4. Develop performance indicators for procurement effectiveness.	0.85	4
5. Provide ongoing training for procurement staff.	0.83	5

6. Develop mitigation strategies.	0.78	6
7. Implement standardized and efficient procedures.	0.77	7
8. Use data analytics and digital platforms for improved decision-making.	0.77	8
9. Promote partnerships with private sector for innovation and expertise.	0.77	8
10. Utilize alternative procurement models.	0.77	10
11. Establish contingency plans for disruptions.	0.77	11
12. Integrate environmental and social considerations.	0.76	12
13. Involve local communities and civil society.	0.76	13
14. Enhance information sharing and communication through technology.	0.76	14
15. Identify and assess procurement risks.	0.76	14
16. Develop contract templates.	0.75	16
17. Establish feedback and grievance redressal mechanisms.	0.74	17
18. Implement monitoring systems to track processes and outcomes.	0.74	17
19. Conduct regular audits and assessments.	0.74	17
20. Enhance procurement with risk management strategies.	0.73	20
21. Implement effective contract and supplier relationship management.	0.73	21
22. Adopt strategic sourcing and category management.	0.72	22
23. Utilize e-procurement platforms to streamline processes.	0.58	23
24. Adopt e-procurement systems for efficiency and transparency.	0.57	24
25. Encourage continuous learning and development.	0.51	25
26. Establish monitoring and evaluation framework.	0.48	26
27. Leverage digital technologies for automation and optimization.	0.46	27
28. Integrate procurement systems for data management and analytics.	0.42	28

Examining the RII scores and rankings with regards to improvement strategies for public procurement management maturity in Adama City Administration reveals three prominent strategies with the highest potential for positive impact (Table 4.8). These are: outlining a clear vision, mission, values, and stakeholder roles (Rank 1, RII score: 0.93), setting clear rules, standards, and procedures (Rank 2, RII score: 0.91), and promoting transparency, accountability, and responsibility (Rank 3, RII score: 0.89). The high RII scores assigned to these strategies signify their significant potential to enhance the maturity level of public procurement management within the city administration.

The strategy ranked first, outlining a clear vision, mission, values, and stakeholder roles (0.93 RII score), emphasizes the importance of a well-defined organizational structure and purpose. A clearly articulated vision provides direction, while a mission statement outlines the core function. Establishing a strong set of values ensures ethical conduct and alignment towards shared goals amongst all involved in the procurement process. Finally, identifying stakeholders and their roles fosters meaningful participation from all relevant parties. Clear rules, standards, and procedures (Rank 2, RII score: 0.91) are essential for ensuring fairness, efficiency, and transparency in public procurement. These guidelines should be documented, readily accessible to all stakeholders, and updated to reflect evolving legislation and best practices.

Promoting transparency, accountability, and responsibility (Rank 3, RII score: 0.89) constitutes a cornerstone of good governance in public procurement. Transparency signifies an open process where stakeholders have access to necessary information. Accountability entails establishing clear lines of responsibility throughout the procurement process. Finally, responsibility ensures that those involved are held accountable for their actions. By prioritizing these top-ranked management strategies, Adama City Administration can make significant strides towards maturing its public procurement management system. This will ultimately lead to a fairer, more efficient, and transparent procurement process, resulting in positive outcomes for the city.

Continuing down the rankings, the 4th and 5th ranked strategies present additional high-impact opportunities for improvement. These are establishing a dedicated procurement unit with qualified staff (Rank 4, RII score: 0.87) and implementing a performance measurement system for procurement (Rank 5, RII score: 0.85). An RII score of 0.87 for "establish a dedicated procurement unit with qualified staff" underscores the importance of a specialized unit staffed with qualified

professionals. This team should possess the necessary knowledge, skills, and experience to navigate the public procurement process effectively, ensuring fairness, efficiency, and transparency.

The RII score of 0.85 for "implement a performance measurement system for procurement" highlights the value of tracking progress and identifying areas for improvement. This system should focus on measuring key performance indicators (KPIs) such as procurement process completion time, cost efficiency, and the quality of procured goods and services. By incorporating these additional strategies alongside the previously identified top-ranked ones, the Adama City Administration has the potential to make significant strides towards solidifying a mature and effective public procurement management system.

4.7 Discussions and Implications of Main Findings

This section presents the key findings of the study, exploring the interplay between public procurement management maturity, sustainable performance of road infrastructure projects, and potential management strategies for improvement within Adama City Administration.

4.7.1 Public Procurement Management Maturity: A Spotlight on Weaknesses

The evaluation of public procurement management maturity within Adama City Administration for delivering road infrastructure projects revealed critical shortcomings. The RII analysis served as a spotlight, identifying weaknesses in three crucial areas (Table 4.5).

The first area of concern pertains to the effectiveness of procurement policies in promoting ethical conduct and preventing corruption (Rank 28, RII score 0.38). This low score suggests that the current policies may be inadequate in deterring unethical behavior and fostering a culture of transparency. This could potentially lead to inefficiencies, inflated costs, and a decline in project quality due to the misuse of resources. The second area for improvement involves the assessment of procurement cycle time and its impact on project timelines (Rank 27, RII score 0.40). The low RII score indicates that the procurement process might be experiencing delays, hindering the timely completion of road infrastructure projects. These delays can have a ripple effect, causing disruptions in traffic flow, economic activities, and overall project budgets.

Finally, the RII analysis highlighted a potential lack of collaboration between the procurement department and other relevant departments within the administration (Rank 26, RII score 0.42).

This disconnect (indicated by the low score) could lead to siloed information, hindering a holistic approach to procurement and potentially causing inefficiencies. Effective road infrastructure development requires seamless collaboration between the procurement department, engineering departments, and other stakeholders to ensure the acquisition of the right materials, equipment, and services at the right time and cost. In essence, these findings illuminate a potential misalignment between procurement activities and the administration's objectives. The low RII scores suggest inefficiencies in the procurement process and a lack of collaboration that could be hindering the successful delivery of road infrastructure projects in Adama City.

From a theoretical standpoint, this study enriches the literature by providing empirical evidence from Adama. Managerially, the findings can guide project managers in aligning procurement with objectives, streamlining processes, and fostering departmental collaboration. Practically, the results can inform policy-making and strategic planning for effective public procurement management in Adama and similar contexts.

4.7.2 Sustainable Performance of Road Projects: Addressing Critical Areas

The evaluation of sustainable performance in Adama City Administration's Road infrastructure development projects exposed critical areas that require improvement. The RII analysis served as a diagnostic tool, pinpointing concerning trends in three key performance indicators (Table 4.6).

The first area of concern is the appropriateness of design to meet project goals (Rank 19, RII score 0.37). This low score suggests a potential disconnect between the initial objectives of a project and the final design that is implemented. This mismatch could lead to roads that are not suited for the intended traffic volume, lack necessary features for specific uses (e.g., pedestrian walkways, bicycle lanes), or fail to consider future growth patterns. As a result, the road infrastructure may not deliver the anticipated economic and social benefits, ultimately hindering the sustainability of the project.

The second troubling indicator is the level of ongoing upkeep and preservation of infrastructure (Rank 18, RII score 0.38). The low RII score suggests that proper maintenance practices may be inadequate, leading to premature deterioration of the roads. This can cause safety hazards, increase traffic congestion due to potholes and cracks, and necessitate costly repairs or even reconstruction

in the long run. Sustainable infrastructure development necessitates a lifecycle approach that prioritizes preventive maintenance to ensure the longevity and functionality of the roads.

Finally, the RII analysis highlighted a potential lack of prioritization for user safety (Rank 17, RII score 0.41). This low score suggests that safety features like proper signage, lighting, and pedestrian crossings may be neglected during design or construction. Additionally, it could indicate a lack of consideration for different user groups, such as cyclists or people with disabilities. Sustainable road infrastructure development should prioritize the safety of all users, not just vehicles.

In conclusion, these findings illuminate crucial areas for improvement in the sustainable performance of Adama City Administration's Road infrastructure projects. The low RII scores suggest a potential mismatch between project goals and designs, inadequate maintenance practices, and a lack of focus on user safety. Addressing these shortcomings is essential for ensuring the long-term social, economic, and environmental sustainability of the city's road network.

4.7.3 Correlation Between Procurement and Sustainability: The Positive Correlation:

This study delved into the relationship between the maturity of public procurement management and the sustainable performance of road infrastructure projects within Adama City Administration. The Pearson Moment Product Correlation analysis, a statistical technique, unearthed significant positive correlations, indicating a mutually beneficial relationship between these two aspects (Table 4.7).

The strongest correlations were observed in two key areas:

- **Considering Sustainability, Social Responsibility, and Environmental Factors:** A correlation coefficient of 0.561 suggests a strong positive link between mature procurement practices and integrating sustainability factors into procurement decisions. This implies that as public procurement in Adama becomes more mature, there's a greater emphasis on selecting materials, equipment, and services that minimize environmental impact, promote social responsibility (e.g., fair labor practices), and contribute to the overall sustainability of the road project.

- **Efficiency of Procurement Processes with Standardized Procedures and Modern ICT Tools:** Another strong positive correlation (0.550) emerged between mature procurement practices and the use of efficient processes with standardized procedures supported by modern Information and Communication Technology (ICT) tools. This suggests that a well-developed public procurement system in Adama is likely to leverage standardized procedures and modern technology to streamline the procurement process. This efficiency can translate to faster project completion times, potentially reducing the environmental footprint associated with extended construction periods. Additionally, efficient processes can minimize errors and delays, leading to cost savings that can be reinvested in sustainable features for the road project.

In essence, these findings highlight the critical role of public procurement management maturity in achieving sustainable infrastructure development in Adama. While previous research has emphasized aligning procurement with organizational goals and achieving efficiency, this study adds a unique perspective by demonstrating the positive link between mature procurement and achieving sustainability objectives. This link is particularly significant in the context of Adama, providing valuable insights for policymakers and project managers to consider when developing and implementing sustainable road infrastructure projects.

From a theoretical standpoint, this research enriches the understanding of public procurement management by providing empirical evidence from Adama. Managers can leverage these findings to prioritize practices that integrate sustainability factors and efficient processes with modern technology into procurement decisions. Practically, the results can inform policy-making and strategic planning for sustainable road infrastructure development in Adama and similar contexts.

4.7.4 Prioritizing Management Strategies for Sustainable Procurement

This study explored potential management strategies to bolster public procurement management maturity within Adama City Administration. The focus was on promoting sustainable practices in road development projects. The RII analysis served as a guiding light, illuminating three key strategies with the highest potential for positive impact (Table 4.8).

The first and most crucial strategy involves outlining a clear vision, mission, values, and stakeholder roles (RII score: 0.93). This translates to establishing a well-defined organizational

structure and a clearly articulated purpose for the procurement department. A well-defined vision sets the direction for all procurement activities, ensuring they align with the overall goal of sustainable road development. A clearly outlined mission specifies the department's purpose, emphasizing its role in acquiring the necessary resources for sustainable infrastructure projects. Furthermore, establishing core values promotes ethical conduct and transparency throughout the procurement process, fostering trust and responsible decision-making. Finally, defining stakeholder roles fosters collaboration and ensures everyone involved understands their responsibilities in achieving sustainable procurement objectives.

The second strategy emphasizes setting clear rules, standards, and procedures (RII score: 0.91). This translates to establishing a well-defined framework for conducting procurement activities. Clear rules and procedures streamline the process, minimize the risk of errors or misconduct, and ensure consistency in decision-making. Standardized procedures promote transparency by providing a clear roadmap for all stakeholders to follow. This reduces the potential for manipulation or bias, leading to fairer competition and more sustainable procurement outcomes. Furthermore, clear and well-defined procedures can help expedite the procurement process, potentially reducing project timelines and minimizing the environmental impact associated with extended construction periods.

The third strategy focuses on promoting transparency, accountability, and responsibility (RII score: 0.89). This translates to fostering a culture of trust and ethical conduct within the procurement department and among all stakeholders involved in road development projects. Transparency involves making procurement information readily available to the public and relevant stakeholders. This fosters public trust and allows for scrutiny, which can help deter corruption and ensure resources are allocated efficiently towards sustainable practices. Accountability emphasizes holding individuals and departments responsible for their actions within the procurement process. This encourages responsible decision-making and ensures that sustainability principles are prioritized throughout the acquisition cycle.

By prioritizing these three key strategies, Adama City Administration can significantly enhance the maturity of its public procurement management system. This, in turn, will lead to more sustainable road development projects, promoting environmental responsibility, social well-being, and long-term economic benefits for the city. The findings of this study contribute to the existing

knowledge by highlighting the specific relevance of these strategies within the context of achieving sustainable infrastructure development. While prior research emphasizes the general value of these strategies for effective procurement, this study offers a unique perspective by demonstrating their critical role in achieving sustainability goals in road projects.

The results hold value across different theoretical, managerial, and practical aspects. From a theoretical standpoint, this research enriches the understanding of public procurement management by providing empirical evidence from Adama. Managers can leverage these findings to prioritize strategies that establish a clear organizational direction, implement transparent procedures, and promote ethical conduct within procurement practices. Practically, the results can inform policy-making and strategic planning for sustainable road infrastructure development in Adama and similar contexts.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study investigated the interplay between public procurement management maturity, sustainable performance of road infrastructure projects, and potential management strategies for improvement within Adama City Administration. The findings offer valuable insights for policymakers and project managers to consider when developing and implementing sustainable road infrastructure projects. The key findings are presented as follows:

- The evaluation of public procurement management maturity in Adama City Administration revealed shortcomings in areas like policy effectiveness, procurement cycle times, and interdepartmental collaboration. These inefficiencies highlight a potential misalignment between procurement activities and the administration's objectives for sustainable road development.
- The assessment of sustainable performance in Adama's road projects exposed critical areas for improvement. These include mismatched project designs, inadequate maintenance practices, and a lack of prioritization for user safety. Addressing these shortcomings is essential for ensuring the long-term social, economic, and environmental sustainability of the city's road network.
- A significant positive correlation was found between the maturity of public procurement management and the sustainable performance of road infrastructure projects. This suggests that as public procurement practices become more mature, there's a greater emphasis on integrating sustainability factors and implementing efficient processes, ultimately leading to more sustainable road development outcomes.
- The study identified three key management strategies with the highest potential to improve public procurement management maturity: (a) Outlining a clear vision, mission, values, and stakeholder roles; (b) Setting clear rules, standards, and procedures; and (c) Promoting transparency, accountability, and responsibility

By prioritizing these management strategies and addressing the identified weaknesses in both procurement practices and project sustainability, Adama City Administration can significantly

enhance the effectiveness and sustainability of its road infrastructure development projects. This, in turn, can contribute to the city's long-term economic growth, social well-being, and environmental responsibility. Overall, this study contributes to the existing body of knowledge by demonstrating the critical role that mature public procurement management plays in achieving sustainable infrastructure development. The findings provide valuable guidance for policymakers and project managers to create a more sustainable future for Adama and similar cities.

5.2 Recommendations

This study investigated the interplay between public procurement management maturity and sustainable performance of road infrastructure development projects in Adama City Administration. The findings revealed critical areas for improvement in both procurement practices and project sustainability. Based on these insights, the following recommendations are proposed to enhance the maturity of Adama's public procurement management system and promote sustainable road development projects.

- Develop a clear vision, mission, values, and stakeholder roles
 - As the study identified a potential misalignment between procurement activities and the administration's objectives for sustainable development, establishing a well-defined vision statement is crucial. This will set the direction for all procurement activities, ensuring alignment with the city's overall sustainability goals.
 - Similarly, a clearly articulated mission statement for the procurement department, emphasizing its role in acquiring resources for sustainable infrastructure projects, is recommended.
 - To promote ethical conduct and transparency throughout the process (a shortcoming identified in the evaluation), a defined set of core values should be established.
 - Finally, clearly defining stakeholder roles and responsibilities will foster collaboration and ensure everyone understands their contribution to achieving sustainable procurement objectives.
- Implement clear rules, standards, and procedures

- The study highlighted inefficiencies in the procurement process, potentially due to a lack of standardized procedures. To address this, developing a comprehensive set of procurement rules and procedures is recommended. These should streamline the process, minimize errors, and ensure consistent decision-making.
- Standardizing these procedures will provide a clear roadmap for all stakeholders involved, promoting transparency and reducing the potential for manipulation or bias.
- Regularly reviewing and updating these procedures is essential to reflect best practices and emerging trends in sustainable procurement for road infrastructure projects.
- Promote transparency, accountability, and responsibility:
 - The evaluation revealed a potential lack of collaboration between the procurement department and other relevant departments. Fostering a culture of openness and trust within the department and among all stakeholders involved in road development projects is crucial.
 - Increased transparency by making procurement information readily available to the public and relevant stakeholders can deter corruption and allow for public scrutiny.
 - Implementing clear accountability mechanisms to hold individuals and departments responsible for their actions within the procurement process is vital. This encourages responsible decision-making and ensures that sustainability principles are prioritized throughout the acquisition cycle.
 - Regular monitoring and evaluation of procurement practices will identify areas for improvement and ensure alignment with sustainable development goals.

5.3 Further Research

This study has opened doors for further research to explore the intricate relationship between public procurement management and sustainable infrastructure development:

- Conduct in-depth studies to understand the reasons behind the specific weaknesses identified in Adama City Administration's procurement practices and project sustainability performance.

- Investigate methods to address these weaknesses and implement the recommended strategies for improved public procurement management maturity.
- The study found a positive correlation between mature procurement and sustainable infrastructure development. Further research, like case studies or comparative analyses, could explore how to strengthen this positive correlation.
- Examine the challenges associated with implementing these recommendations in the context of public procurement management for road infrastructure development projects in different geographic and economic contexts.
- Investigate the cost-effectiveness of implementing sustainable procurement practices and their potential long-term benefits for social, economic, and environmental well-being.

Future studies can contribute valuable knowledge and practical guidance for policymakers and project managers worldwide, ultimately leading to the development of more sustainable and efficient road infrastructure projects by pursuing the above-listed research avenues.

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APPENDIX A. QUESTIONNAIRE SURVEY



Faculty of Technology

Postgraduate Program

Department of Construction Technology and Management

Introduction

Dear Participant,

My name is Fikadu Dubissa, and I am a Master's student in Construction Technology and Management at Addis College. I am conducting research for my thesis titled: "Exploring the Nexus between Procurement Management Maturity and Road Infrastructure Development Projects: An Empirical Study in Adama City."

The general objective of this study is to investigate the relationship between the level of procurement management maturity and the effectiveness and sustainability of road infrastructure development projects in Adama, Ethiopia. This research utilizes an empirical approach to provide insights into the current practices and potential areas for improvement within the sector and aims to unveil the intricate relationship between procurement management practices and the success of road infrastructure projects in Adama City, Ethiopia.

This first round survey is divided into three sections, each addressing a specific objective and the general information about respondents:

- Section 1: We will gather the respondent's profiles as it will determine the validity of the entire study.

- Section 2: We will assess the maturity level of public procurement management practices in the road sector in Adama. Here, you will be asked to rate the maturity level of different procurement criteria to understand that how well each criterion are currently being implemented.
- Section 3: We will evaluate the effectiveness and sustainability of recently completed road infrastructure projects in Adama. You will be asked to rate your agreement with different criteria used to measure effectiveness and sustainability.
- Section 4. We will prioritize the strategies for improving public procurement management maturity of the public client to successfully deliver road infrastructure road projects. You will be asked to rate your agreement with different criteria used to measure effectiveness and sustainability.

The entire survey would take approximately 15-20 minutes to complete. Your responses will be kept strictly confidential and used solely for this research project. By participating in this survey, you will contribute valuable insights that will help improve the management of road infrastructure development projects in Adama and beyond.

Thank you for your time and cooperation.

Sincerely,

Fikadu Dubissa

MSc Student, Addis College

Section 1: General Information about the Respondents.

1.1 Educational Background. Please select the highest level of education you have achieved.

- High School Diploma
- Associate Degree
- Bachelor's Degree
- Master's Degree
- Doctorate or higher
- Other (Please specify): _____

1.2 Name of the Organization: Please select the name of the organization of company your are working for.

- Client
- Contractor
- Consultant
- Regulator Body
- Other (Please specify): _____

1.3 Current Job Title/Responsibility. Briefly describe your current position and primary responsibilities within your company or organization.

- Job Title: _____
- Primary Responsibilities: _____

1.4 Total Years of Experience in the Construction Industry. How many years of total experience do you have working in the construction industry?

- Years of Experience: _____

1.5 Experience in Public Procurement (Years). If you have any experience in public procurement, enter the number of years you have worked in this specific area.

- Years of Experience in Public Procurement: _____ (Enter 0 if none)

1.6 Experience in Procuring Entity (Years). Have you ever worked for a public entity involved in construction procurement? If yes, enter the total number of years of experience.

- Years of Experience in Procuring Entity: _____ (Enter 0 if none)

1.7 Additional Information

Please include any other relevant information that you believe is pertinent to this survey.

Additional Details: _____

Section 2: Public Procurement Management Maturity Level Assessment

This survey aims to assess the current state of your organization's public procurement practices in the road sector. Your responses will help us identify areas for improvement. We will present you with several procurement maturity criteria. Please rate how well each criterion reflects the current practices within your organization using the following scale:

- Strongly Disagree (1): Our organization does NOT follow this practice.
- Disagree (2): This practice is implemented inconsistently or to a minimal degree.
- Somewhat Agree (3): This practice is somewhat implemented, but there's room for improvement.
- Agree (4): This practice is consistently implemented.
- Strongly Agree (5): This practice is not only implemented but also optimized for best results.

Procurement Management Maturity Assessment Criteria	Level of agreement				
Alignment of procurement strategy with organizational objectives and road infrastructure development goals.	1	2	3	4	5
Integration of procurement plans with other strategic plans, considering risk, quality, and budget.	1	2	3	4	5
Development of comprehensive and individual project procurement plans, outlining objectives, timelines, budget, and risk strategies.	1	2	3	4	5
Evaluation of the procurement strategy's responsiveness to changes in organizational objectives and market conditions.	1	2	3	4	5
Assessment of the strategic procurement decision-making process and its alignment with long-term infrastructure goals.	1	2	3	4	5
Monitoring and evaluation of procurement performance using key performance indicators (KPIs).	1	2	3	4	5
Regular reviews, audits, and feedback mechanisms for continuous improvement.	1	2	3	4	5
Use of performance metrics to track efficiency, cost savings, and project delivery timelines.	1	2	3	4	5
Analysis of the procurement system's ability to adapt to new performance metrics and KPIs.	1	2	3	4	5
Benchmarking procurement performance against industry standards and best practices.	1	2	3	4	5

Structure and roles within the procurement department, including a dedicated team for managing road infrastructure projects.	1	2	3	4	5
Clearly defined and communicated roles and responsibilities, with support from leadership for procurement initiatives.	1	2	3	4	5
Succession planning, talent retention, and a culture of continuous learning and improvement.	1	2	3	4	5
Examination of the procurement department's integration with other departments to achieve organizational synergy.	1	2	3	4	5
Evaluation of the effectiveness of the decision-making hierarchy within the procurement function.	1	2	3	4	5
Efficiency of procurement processes and utilization of standardized procedures supported by modern ICT tools.	1	2	3	4	5
Encouragement and adoption of innovative procurement methods, tools, and techniques.	1	2	3	4	5
Defined processes for supplier selection, evaluation, and relationship management.	1	2	3	4	5
Assessment of the procurement cycle time and its impact on project timelines.	1	2	3	4	5
Review of the procurement department's approach to innovation and its impact on process efficiency.	1	2	3	4	5
Competence and skills of procurement staff, with provision for continuous training and development.	1	2	3	4	5
A workforce with the necessary expertise in procurement management.	1	2	3	4	5
Analysis of the alignment between staff competencies and the strategic needs of procurement projects.	1	2	3	4	5
Evaluation of the effectiveness of professional development programs in keeping pace with industry changes.	1	2	3	4	5
Consideration of sustainability, social responsibility, and environmental factors in procurement decisions.	1	2	3	4	5
Ethical practices, integrity, transparency, accountability, and fairness in procurement.	1	2	3	4	5
Review of the procurement policies' effectiveness in promoting ethical behavior and preventing corruption.	1	2	3	4	5
Assessment of the impact of procurement activities on local communities and the environment.	1	2	3	4	5

Section 3: Sustainable Performance of Road Infrastructure Development Projects

This section of the survey focuses on your experience with a recent road infrastructure development project. Your honest feedback will be incredibly valuable in helping us understand how effective and sustainable these projects are in the long run.

We'll be asking you to rate your agreement with different criteria related to the project's effectiveness and sustainability. Here's a quick guide to the scale we'll be using:

- 1. Strongly Disagree: This indicates the project performs very poorly in this specific sustainability measure.
- 2. Disagree: The project has a negative impact on this measure, but it's not the worst outcome.
- 3. Neutral: The project has no significant positive or negative impact on this measure.
- 4. Agree: The project has a positive impact on this measure, but there's room for improvement.
- 5. Strongly Agree: This indicates the project performs exceptionally well in this specific sustainability measure.

Sustainable Performance Measures	Level of Agreement				
Adequacy and stability of funding sources.	1	2	3	4	5
Comprehensive and realistic project planning.	1	2	3	4	5
Appropriateness of design to meet project goals.	1	2	3	4	5
Efficiency and timeliness of project execution.	1	2	3	4	5
Ongoing upkeep and preservation of infrastructure.	1	2	3	4	5
Assessment of multiple aspects to inform decision-making.	1	2	3	4	5
The extent to which the infrastructure is usable by all intended users.	1	2	3	4	5
Improvement in the movement of people and goods.	1	2	3	4	5
Reduction in accidents and enhancement of user security.	1	2	3	4	5
Economic feasibility for users and stakeholders.	1	2	3	4	5

Fair distribution of infrastructure benefits among different social groups.	1	2	3	4	5
Influence on local and regional economic development.	1	2	3	4	5
Effects on community well-being and social structures.	1	2	3	4	5
Involvement of all relevant parties in decision-making processes.	1	2	3	4	5
Ability to withstand and recover from adverse conditions.	1	2	3	4	5
Minimization of environmental pollution.	1	2	3	4	5
Evaluation of environmental impacts throughout the project's life cycle.	1	2	3	4	5
Comparison of project costs against benefits.	1	2	3	4	5
Consequences for natural ecosystems and biodiversity.	1	2	3	4	5

Section 4. Strategies for Improving Public Procurement Management Maturity

The last specific objective of the study is to prioritize management strategies/mechanisms for improving/enhancing public procurement management maturity of public road sector client in delivering road infrastructure development projects. In this segment, you will find statements that describe various management strategies. For each statement, you will be asked to express your level of agreement using a detailed five-level Likert scale:

- Strongly Disagree (1): This strategy is unlikely to be effective in improving public procurement management maturity for road projects.
- Disagree (2): This strategy has limited impact on achieving public procurement management maturity for road projects.
- Neutral (3): The impact of this strategy on public procurement management maturity for road projects is unclear or negligible.
- Agree (4): This strategy has a positive and relevant contribution to improving public procurement management maturity for road projects.
- Strongly Agree (5): This strategy is essential for achieving a high level of public procurement management maturity and successful road project delivery.

Strategies for Improving Public Procurement Management Maturity	Level of Agreement				
Outline vision, mission, values, and stakeholder roles.	1	2	3	4	5
Establish monitoring and evaluation framework.	1	2	3	4	5
Set clear rules, standards, and procedures.	1	2	3	4	5
Promote transparency, accountability, and responsibility.	1	2	3	4	5
Adopt strategic sourcing and category management.	1	2	3	4	5
Implement effective contract and supplier relationship management.	1	2	3	4	5
Enhance procurement with risk management strategies.	1	2	3	4	5
Leverage digital technologies for automation and optimization.	1	2	3	4	5
Integrate procurement systems for data management and analytics.	1	2	3	4	5
Encourage continuous learning and development.	1	2	3	4	5
Involve local communities and civil society.	1	2	3	4	5
Establish feedback and grievance redressal mechanisms.	1	2	3	4	5
Develop performance indicators for procurement effectiveness.	1	2	3	4	5
Implement monitoring systems to track processes and outcomes.	1	2	3	4	5
Conduct regular audits and assessments.	1	2	3	4	5
Adopt e-procurement systems for efficiency and transparency.	1	2	3	4	5
Use data analytics and digital platforms for improved decision-making.	1	2	3	4	5
Enhance information sharing and communication through technology.	1	2	3	4	5
Identify and assess procurement risks.	1	2	3	4	5
Develop mitigation strategies.	1	2	3	4	5
Establish contingency plans for disruptions.	1	2	3	4	5
Promote partnerships with private sector for innovation and expertise.	1	2	3	4	5
Integrate environmental and social considerations.	1	2	3	4	5
Utilize alternative procurement models.	1	2	3	4	5
Implement standardized and efficient procedures.	1	2	3	4	5
Utilize e-procurement platforms to streamline processes.	1	2	3	4	5
Develop contract templates.	1	2	3	4	5
Provide ongoing training for procurement staff.	1	2	3	4	5

APPENDIX B. AN INTERVIEW QUESTIONS

As part of data collection instruments, semi-structured interviews will be conducted, utilizing a pre-determined interview guide with open-ended questions to allow for in-depth exploration of participants' experiences and perspectives. The interviewer will maintain a flexible approach, allowing for probing questions and follow-up discussions based on the participant's responses.

The interview will address the following key areas, with specific questions tailored to each professional group:

1. Procurement management practices

- Can you describe the typical procurement process followed for road infrastructure projects in your organization?
- What are the key challenges you face in ensuring effective procurement practices?
- In your opinion, how can procurement management maturity be improved in your organization?

2. Project effectiveness and sustainability

- Based on your experience, what factors contribute to the successful completion of road infrastructure projects in Adama?
- How do procurement practices influence the long-term sustainability of these projects?
- Can you share specific examples of projects that demonstrate best practices or highlight challenges in procurement and project outcomes?

3. General observations

- Do you have any additional insights or recommendations regarding the relationship between procurement management and project outcomes in Adama?