Mekelle University

School of Civil Engineering

Master Degree Program in Construction Technology and Management

Challenges and Impact of Procuring Mechanical & Electrical Materials in Ethiopian Market on Project Execution (Case A: NOC National Oil Headquarter Building and Case B: Shegole Bus Station)

This Independent Research Project Report is Submitted to the Construction Technology and Management Chair at the School of Civil Engineering, Mekelle University as partial fulfillment for the Degree of Master of Engineering in Construction Technology and Management

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DECLARATION

I hereby declare that this thesis, entitled "Challenges and Impact of Procuring Mechanical & Electrical Materials in the Ethiopian Market on Project Execution", is my own original work and has not been submitted for any degree or examination at this or any other university. All sources of information have been duly acknowledged in the text and through comprehensive reference.

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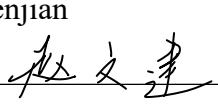
Signature: 

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CERTIFICATION

This is to certify that the thesis entitled **"Challenges and Impact of Procuring Mechanical & Electrical Materials in the Ethiopian Market on Project Execution"**, submitted by **Zhao Wenjian**, fulfills part of the requirements for the award of the degree of **Master of Science in Construction Management** and has been examined and approved.

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Abstract

The procurement of Mechanical and Electrical (M&E) materials is a critical determinant of project success in Ethiopia's construction sector, yet it poses significant challenges that adversely affect schedule, cost, and quality. Although procurement issues in developing economies are widely recognized, a specific research gap exists regarding M&E materials—distinguished by their technical complexity, certification requirements, and high import dependency. This study addresses this gap by investigating procurement challenges and their impacts through a comparative analysis of two project strategies: import-dependent versus locally sourced.

Using a qualitative case study design with embedded quantitative analysis, the research examines the NOC National Oil Headquarter Building Project (import-based) and the Shegole Bus Station Project (locally sourced), supplemented by a survey of ten construction firms. Findings indicate that dependence on imported M&E materials introduces substantial risks, including customs delays, foreign currency shortages, and supply chain disruptions. In the NOC project, these factors led to a 4–5-month overall delay, with M&E procurement accounting for 82% of schedule overrun and a 12.3% cost overrun. Conversely, the Shegole project, using locally sourced materials, showed greater resilience, experiencing only a 2-month delay and a 3.4% cost variance, with challenges related mainly to weather and local market fluctuations.

The study concludes that Ethiopia's reliance on imported M&E components creates systemic vulnerabilities. To address this, the thesis proposes targeted recommendations: project managers should adopt hybrid sourcing and early procurement planning; policymakers should streamline customs and support local manufacturing; and suppliers should pursue quality certifications and collaborative forecasting. This research contributes context-specific insights to construction supply chain management in emerging economies, offering a practical framework to improve procurement efficiency and reduce external dependencies in Ethiopia's infrastructure development.

Keywords: Procurement Challenges, M&E Materials, Construction Projects, Ethiopia, Import Dependency, Local Sourcing, Project Delays, Cost Overruns, Supply Chain Management.

ACRONYMS AND ABBREVIATIONS

- **AfDB** – African Development Bank
- **BIM** – Building Information Modeling
- **BMS** – Building Management System
- **CIF** – Cost, Insurance, and Freight
- **CSCEC** – China State Construction Engineering Corporation
- **ECWC** – Ethiopian Construction Works Corporation
- **FOB** – Free On Board
- **GDP** – Gross Domestic Product
- **HVAC** – Heating, Ventilation, and Air Conditioning
- **ICT** – Information and Communication Technology
- **L/C** – Letter of Credit
- **M&E** – Mechanical and Electrical
- **NBE** – National Bank of Ethiopia
- **NOC** – National Oil Company
- **QA/QC** – Quality Assurance / Quality Control

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Chapter 1: Introduction

1.1 Background of the Study

The construction industry functions as a fundamental pillar for national economic development, providing the essential physical infrastructure required for public services, commerce, and industrial growth. Within this sector, the procurement of Mechanical and Electrical (M&E) materials—encompassing systems for heating, ventilation, air conditioning (HVAC), fire protection, electrical distribution, plumbing, and communication networks—constitutes a critical and technologically complex component. The efficiency and effectiveness of procuring these specialized materials directly influence core project success metrics, including timely completion, budget adherence, and long-term functional quality (Lysons & Farrington, 2020).

In Ethiopia, the construction sector has been a significant driver of economic activity, contributing approximately 20% to the national Gross Domestic Product (GDP) and sustaining an average annual growth rate of 8.5% between 2018 and 2022 (Ethiopian Ministry of Finance, 2023). Despite this growth, the procurement process for M&E materials remains a persistent and systemic bottleneck. The sector exhibits a high degree of import dependency, sourcing over 85% of advanced M&E components from international markets, with China, Europe, and Turkey being the primary sources (UN COMTRADE, 2023). This reliance on external supply chains introduces multiple vulnerabilities, including recurring foreign currency shortages that delay payments, protracted customs clearance procedures averaging 14 days at the Port of Djibouti, and frequent logistical disruptions along the transport corridor to Addis Ababa (World Bank, 2020).

The contrasting experiences of two major projects underscore the strategic importance of procurement sourcing. The NOC National Oil Headquarter Building Project, with a budget of 790 million Birr and a 50-month planned duration, experienced significant execution delays directly attributable to challenges in procuring imported M&E systems. In contrast, the Shegole Bus Station Project, a 210 million Birr undertaking completed in 26 months, utilized predominantly locally sourced M&E materials and was executed with minimal procurement-related disruptions. These divergent outcomes highlight the critical, yet under-researched, link between procurement strategy for M&E materials and overall project performance in the

Ethiopian context.

1.2 Statement of the Problem

Despite considerable public and private investment in infrastructure development, Ethiopian construction projects are chronically plagued by performance shortfalls. Industry analyses indicate that projects frequently exceed their original schedules by 30-40% and suffer cost overruns in the range of 20-25% (Ethiopian Construction Works Corporation, 2022). Empirical evidence suggests that issues stemming specifically from the procurement of M&E materials are a primary contributor, accounting for approximately 65% of these project delays (Mekonnen & Aklilu, 2020). Contractors reliant on imported materials navigate a complex landscape of bureaucratic hurdles, logistical inefficiencies, and financial constraints, which are exacerbated by systemic challenges such as scarce foreign currency reserves, unpredictable regulatory changes, and a severely limited local manufacturing base for advanced M&E components.

While existing academic and grey literature acknowledges general procurement challenges within developing economies and Ethiopia specifically, a significant research gap persists. Current studies often adopt a broad perspective, failing to isolate and deeply analyze the unique procurement dynamics inherent to M&E materials. These materials are distinguished by their technical specificity, long manufacturing lead times, requirement for international quality certifications, and need for specialized installation—all factors that amplify procurement risks (Bekele & Bayou, 2021). The absence of focused, empirical research that dissects these M&E-specific challenges within the Ethiopian market hinders the development of targeted, effective mitigation strategies. Consequently, the industry remains trapped in a cycle of repeated project failures characterized by similar patterns of delay and cost escalation, undermining national development goals and investor confidence.

1.3 Objectives of the Study

General Objective: To investigate the challenges and impacts of procuring M&E materials in the Ethiopian market on project execution.

Specific Objectives:

1. To identify key challenges in procuring M&E materials, including supply chain delays,

quality issues, and cost fluctuations.

2. To assess the impact of procurement-related challenges on project timelines, budgets, and execution efficiency.

1.4 Research Questions

To guide the inquiry and achieve the stated objectives, this study is designed to answer the following research questions:

- What are the predominant and most critical challenges faced in procuring Mechanical and Electrical (M&E) materials for construction projects in Ethiopia?
- How do procurement challenges specific to M&E materials impact project schedules, budgets, and quality standards during execution?
- What are the observable differences in project outcomes—in terms of time, cost, and adaptability—between projects utilizing imported M&E materials and those relying on locally sourced materials?
- What strategic and operational measures can key stakeholders implement to reduce procurement-induced delays and cost overruns?

1.5 Significance of the Study and Research Beneficiaries

This research holds significant value for both academic discourse and practical application within Ethiopia's construction sector. Its contributions are framed to address specific gaps in knowledge and provide actionable insights for key stakeholders, thereby identifying clear beneficiaries of the study's outcomes.

1.5.1 Theoretical and Academic Significance

For the academic community, particularly researchers in construction management, supply chain logistics, and development studies, this study offers three key contributions. First, it addresses a identified gap in the literature by providing an in-depth, empirical analysis focused specifically on the procurement dynamics of **Mechanical and Electrical (M&E) materials**—a technically complex and critically impactful subset of construction inputs that is often undifferentiated in broader procurement studies. Second, it employs a **comparative case study methodology** within a single national context, rigorously contrasting the performance outcomes of import-dependent versus locally-sourced procurement strategies. This approach

yields nuanced, context-rich insights that surveys alone cannot provide. Third, the study is grounded in and contributes to **theoretical frameworks** such as Supply Chain Disruption Theory and the Resource-Based View, applying them to the unique challenges of an emerging economy's construction market.

1.5.2 Practical Significance and Stakeholder Beneficiaries

The primary practical value of this research lies in its direct applicability to the actors who execute, govern, and support construction projects in Ethiopia. The findings and recommendations are designed to benefit the following key stakeholder groups:

- **Project Managers, Contractors, and Consultants:** As the primary implementers, they will benefit from the comparative analysis of procurement risks and the documented consequences of different sourcing strategies. The study provides a framework for making informed procurement decisions, enhancing risk assessment during the planning phase, and developing more resilient project schedules and budgets. The case-based lessons on managing import logistics and leveraging local supply chains offer directly transferable knowledge.
- **Government Agencies and Policymakers (e.g., Ministry of Finance, National Bank of Ethiopia, Ethiopian Customs Commission):** For regulators and policymakers, this study delivers evidence-based diagnostics of systemic bottlenecks, such as customs inefficiencies, foreign exchange allocation challenges, and the mismatch between local content ambitions and industrial capacity. The analysis can inform targeted policy reforms and institutional interventions aimed at streamlining processes, incentivizing local production, and creating a more conducive environment for efficient project delivery.
- **Local Suppliers and Manufacturers of M&E Materials:** This group stands to gain from a clear analysis of market gaps and industry demands. The research highlights the specific areas—such as quality certification, technical capability, and after-sales service—where local firms can invest to become more competitive and reliable partners for major projects, thereby supporting import substitution goals.
- **Clients, Developers, and Financial Institutions:** Investors, project owners, and financiers will gain a more nuanced understanding of the execution risks embedded in different procurement pathways. This insight can lead to more realistic project appraisals, improved

risk allocation in contracts, and the development of financial products tailored to the realities of construction procurement in Ethiopia.

- In summary, by generating context-specific knowledge and targeted recommendations, this research aims to equip these interconnected beneficiaries with the tools and understanding needed to mitigate procurement-induced disruptions. The ultimate beneficiary is Ethiopia's infrastructure development agenda itself, which relies on the improved efficiency, cost control, and timeliness of construction project execution.

1.6 Scope of the Study

The scope of this study is deliberately focused to enable a deep, contextual analysis of the research problem.

Scope: The investigation centers on the procurement of Mechanical and Electrical (M&E) materials within the Ethiopian construction industry. The primary methodological approach is a comparative case study of two completed projects in Addis Ababa: the import-dependent NOC Headquarters Building and the locally-sourced Shegole Bus Station. This core analysis is supplemented with data from a survey of ten construction firms to enhance the validity and generalizability of the findings.

Delimitations: Several boundaries define the limits of this research:

The study exclusively addresses M&E materials and does not extend to the procurement of civil works materials (e.g., cement, steel reinforcement) or architectural finishes. The geographical focus is on projects within Addis Ababa; thus, findings may not fully capture procurement dynamics in regional or rural settings. The research relies primarily on retrospective data from completed projects, which may be subject to limitations of documentation and recall bias among interviewees. While multiple stakeholder views are incorporated, the perspectives of certain entities like customs authorities and port operators are limited due to access constraints.

1.7 Limitations of the Study

This research acknowledges several limitations that qualify the interpretation and generalizability of its findings. Geographically, the study focuses primarily on projects within Addis Ababa, which may not fully represent procurement dynamics in regional or rural

construction markets where logistics challenges and supplier availability differ significantly.

Methodologically, the reliance on two primary case studies, while deepened through supplementary survey data, limits broad statistical generalization. The unique characteristics of the selected cases—particularly their scale, complexity, and procurement strategies—mean that findings may not apply equally to all project types across Ethiopia's construction spectrum.

Temporally, the study examines projects completed between 2016-2020, which may not fully capture recent policy changes, market developments, or the evolving impacts of global events such as the COVID-19 pandemic on supply chain dynamics. The retrospective nature of data collection introduces potential recall bias, though this was mitigated through triangulation with documentary evidence.

Perspectival, the research primarily captures the viewpoints of contractors, project managers, and suppliers. While these stakeholders are centrally involved in procurement processes, the perspectives of regulatory authorities, port operators, and financial institutions are less directly represented, potentially overlooking important institutional dimensions of the procurement challenge.

1.8 Structure of the Thesis

This thesis is organized into six sequential chapters to present a coherent and logical argument.

Chapter 2 (Literature Review) critically examines existing theoretical and empirical literature related to construction procurement, M&E materials, challenges in developing economies, and the Ethiopian context, culminating in the precise identification of the research gap this study aims to fill.

Chapter 3 (Research Methodology) details the philosophical stance, research design, case study strategy, methods for data collection and analysis, and ethical protocols employed to ensure the rigor and credibility of the study.

Chapter 4 (Case Study Analysis) presents a detailed, factual account of the two cases, describing their procurement strategies, documenting the challenges encountered, and analyzing the resultant impacts on time, cost, and quality.

Chapter 5 (Discussion) interprets the findings from Chapter 4, relating them back to the

literature reviewed in Chapter 2 and discussing their broader implications for theory and practice within the Ethiopian construction sector.

Chapter 6 (Conclusion and Recommendations) summarizes the key findings, states the principal conclusions drawn, provides actionable recommendations for different stakeholders, acknowledges the study's limitations, and proposes directions for future research.

Chapter 2: Literature Review

2.1 Procurement in Construction Projects

Procurement in construction is a strategic function extending beyond transactional purchasing to encompass the systematic acquisition of all necessary materials, labor, and services. In developing economies, this function is particularly critical, as the procurement environment is often marked by systemic inefficiencies and external dependencies (Ofori, 2000). Lysons and Farrington (2020) conceptualize procurement as a lever for value creation and risk mitigation; however, in contexts like Ethiopia, its strategic potential is frequently overshadowed by operational challenges, leading to reactive rather than proactive management. This reactive posture magnifies vulnerabilities across the extended, multi-stage procurement process, ultimately contributing to the well-documented project failures and cost overruns prevalent in regions such as East and West Africa.

2.2 The Distinctive Nature of Mechanical and Electrical (M&E) Materials

Mechanical and Electrical systems represent a distinct category within construction materials, defined by high technical complexity, stringent performance specifications, and mandatory international certifications (e.g., ISO, UL, CE). Unlike commoditized goods, M&E components require custom manufacturing, specialized installation, and perfect integration within the building ecosystem, resulting in extended lead times and significant capital commitment. In Ethiopia, this inherent complexity is compounded by a pronounced industrial gap. The country exhibits an import dependency rate exceeding 85% for advanced M&E components (UN COMTRADE, 2023), primarily sourced from China, Europe, and Turkey. This reliance fundamentally shifts M&E procurement from a routine logistical activity to a critical project bottleneck, introducing a unique set of risks related to international supply chains, quality verification, and standards alignment that are not equally present in the procurement of civil works materials.

2.3 A Framework of Procurement Challenges in Developing Economies

A synthesis of the literature reveals that procurement obstacles in developing economies

coalesce around four interconnected domains: economic, institutional, infrastructural, and market-related. Economic constraints, such as foreign exchange shortages and volatile currencies, destabilize budgeting and payment for imports. Institutional hurdles, including bureaucratic regimes and unpredictable policy shifts, create an environment of uncertainty. Infrastructural deficiencies, like congested ports and unreliable transportation, directly impede material flow. Finally, market constraints arise from an underdeveloped industrial base, resulting in a scarcity of qualified local suppliers and information asymmetries (Ofori, 2000). Empirically, these factors manifest in procurement cycles that routinely extend 45–90 days beyond plans, with associated cost escalations of 15–25%, figures that are typically exacerbated for technologically intensive items like M&E components. This framework provides a valuable lens but often lacks critical analysis of how these challenges interact dynamically or how their relative severity varies across different project types and procurement strategies.

2.4 The Ethiopian Procurement Context: A System Under Stress

Ethiopia's construction sector operates within a specific and acute instantiation of these broader challenges. Analyses by the World Bank (2020) and the African Development Bank (2019) pinpoint systemic barriers including a critical shortage of foreign currency, restrictive customs administration, and severe congestion at Djibouti Port. The foreign exchange allocation process, managed by the National Bank of Ethiopia, is a particular bottleneck, with approvals for Letters of Credit (L/C) often delayed by 60–90 days. While national policies, such as the Homegrown Economic Reform Agenda, advocate for import substitution, a significant mismatch exists between policy ambition and industrial capacity. The domestic manufacturing base for high-specification M&E items remains nascent, meeting perhaps only 15% of total demand. This context creates a paradox where projects are simultaneously compelled by quality requirements and hindered by systemic vulnerabilities when relying on global supply chains. A critical gap in the literature is the lack of empirical studies that dissect how this macro-level "system under stress" translates into discrete, project-level decisions and outcomes.

2.5 The Consequential Impact on Project Performance

The downstream effects of procurement inefficiencies are measurable across the core

project management dimensions of time, cost, and quality. Delayed material deliveries idle labor, disrupt sequenced activities, and erode critical path float. Financially, delays trigger cost overruns through price escalations, penalties, and accumulating overheads. Perhaps more insidiously, procurement pressures can compromise quality, as time constraints may force the acceptance of non-conforming materials or curtail proper testing (Doloi, 2013). Research suggests the impact is multiplicative; each week of delay in receiving critical M&E materials can consume 1.5 to 2.0 weeks of the overall project schedule. However, existing studies often present these impacts as general correlations. A significant gap exists in providing comparative, quantitative evidence that isolates the differential impact of M&E procurement specifically, and further, distinguishes between impacts stemming from imported versus locally sourced materials.

2.6 Theoretical Foundations: Disruption and Capability

This study is framed by two complementary theoretical perspectives that enable a move from description to analysis. Supply Chain Disruption Theory (Christopher, 2016) provides a framework to analyze how external shocks and inherent vulnerabilities test the resilience of procurement networks. It directs attention to vulnerability nodes—such as single-source suppliers, congested logistics hubs, and opaque regulatory interfaces—and examines strategies for building resilience, including redundancy, flexibility, and collaboration. Complementarily, the Resource-Based View (RBV) of the firm (Barney, 1991) offers an internal lens, positing that sustained performance differentials stem from heterogeneous internal capabilities. This theory helps explain why some contractors navigate procurement chaos more effectively than others, focusing on intangible assets like proprietary supplier relationships, embedded expertise, and adaptive problem-solving routines. The critical synthesis missing from the literature is the integrated application of these theories to explain how external disruptions (analyzed through SCDT) are mediated by the internal capabilities of firms and projects (analyzed through RBV) within a specific context like Ethiopia.

2.7 Synthesis of Previous Empirical Studies and Identification of the Research Gap

A review of extant literature confirms the severity of procurement challenges but reveals a threefold research gap that this thesis aims to address, as summarized in Table 2.1.

Table 2.1: Synthesis of Key Empirical Studies and Identified Gaps

Author(s) & Year	Geographic/Project Focus	Key Findings Related to Procurement	Identified Limitations / Research Gaps
Mekonnen & Aklilu (2020)	Ethiopian construction projects	Found procurement issues as the root cause of delays in 68% of cases, with M&E delays averaging over four months.	Broad focus on general procurement; does not isolate or critically analyze M&E-specific dynamics.
Bekele & Bayou (2021)	Ethiopian building projects	Reported industry-wide cost overruns of 15–25%, significantly higher for import-reliant projects.	Focus on material management broadly; lacks comparative analysis of sourcing strategy outcomes.
Doloi (2013)	Projects in developing economies	Quantitatively linked project failures to procurement	Theoretical model; lacks in-depth, context-rich case analysis of specific

Author(s) & Year	Geographic/Project Focus	Key Findings Related to Procurement	Identified Limitations / Research Gaps
		mismanagement and poor design-procurement coordination.	markets like Ethiopia.
Laryea & Hughes (2011)	Contractor bidding in Africa	Identified material supply chain volatility as a major source of risk and price uncertainty in bidding.	Focus on pre-contract phase; limited examination of execution-phase procurement challenges.
AfDB (2019); World Bank (2020)	Ethiopia (institutional reports)	Corroborated systemic issues: extended customs clearance, forex shortages, and port congestion.	Macro-level, policy-oriented analysis; lacks project-level empirical granularity and theoretical integration.

2.7.1 The Integrated Research Gap

The synthesis above reveals that while the severity of procurement problems is established, the literature remains predominantly descriptive and siloed. First, it lacks critical focus on the unique procurement dynamics of M&E materials. Second, there is a scarcity of empirical comparative analysis that rigorously contrasts the

performance outcomes of import-dependent versus locally-sourced procurement strategies within the same operational environment. Third, and most critically, existing studies show limited theoretical integration; they catalog challenges without sufficiently employing established frameworks like SCDT or RBV to explain causal mechanisms or generate actionable, stakeholder-specific prescriptions.

This study is designed to bridge this integrated gap. By conducting a focused, comparative case study of M&E procurement, and by explicitly employing Supply Chain Disruption Theory and the Resource-Based View as analytical lenses, it moves beyond description. It seeks to explain *how* specific challenges manifest, *why* they impact projects differently, and *what* capabilities and strategies can mitigate their effects, thereby contributing explanatory insights to both theory and practice.

2.8 Emerging Trends and Future Pathways

The global procurement landscape is evolving, presenting both potential solutions and new implementation challenges for Ethiopia. Digitalization (e.g., e-procurement, BIM-integrated logistics) promises greater transparency but faces infrastructural and skill gaps. The trend towards supply chain resilience and localization aligns with national goals, such as the government's target of 35% local M&E production by 2025. However, the transition depends on overcoming substantial barriers: bridging the technology and quality gap, developing technical human capital, and reforming procurement regulations to value long-term performance over lowest-cost bidding. Future research must critically evaluate the feasibility of these trends in the Ethiopian context and assess the effectiveness of hybrid models that blend global technology access with local supply chain resilience.

Chapter 3: Methodology

3.1 Research Philosophy and Design

This study is grounded in a pragmatic research philosophy, which prioritizes the research question and the practical consequences of inquiry over adherence to a single epistemological stance. Pragmatism permits the selection of methodological approaches that best serve the purpose of generating actionable knowledge to address the complex, real-world problem under investigation. Consequently, a sequential explanatory mixed-methods design was employed, characterized by an initial quantitative phase of data collection and analysis followed by a subsequent, in-depth qualitative phase. This design is particularly apt for the study's objectives, as it allows for the quantitative measurement of procurement delays and cost variances to establish the *what* and *how much*, while the subsequent qualitative investigation seeks to explain the underlying *why* and *how*. The core of the study is structured as a comparative, multiple-case study, an approach deemed optimal for investigating a contemporary phenomenon within its authentic context, especially when the boundaries between the phenomenon and its context are not clearly evident.

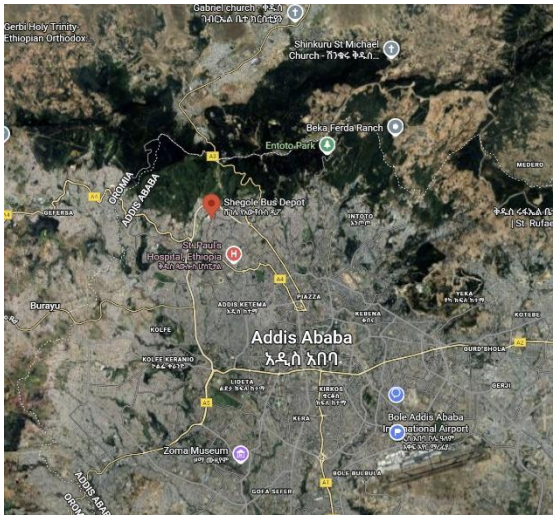
3.2 Case Study Strategy and Rationale

The case study strategy was selected for its capacity to provide a holistic and contextualized analysis of procurement challenges. Given the research aim to understand the nuanced interplay between market conditions, strategic choices, and project outcomes, a case study allows for an exploration of complexity that surveys or experiments cannot capture. This study utilizes a comparative case study framework, deliberately selecting two projects that represent polar types in terms of procurement strategy. This "most different" comparative logic is powerful for isolating the influence of the key variable of interest—sourcing origin—by contrasting a project heavily reliant on imported M&E materials with one that sourced predominantly locally. The analysis focuses on understanding how these divergent strategies, embedded within the same national context, led to markedly different project trajectories and outcomes, thereby illuminating the mechanisms through which procurement affects execution.

3.3 Case Selection and Description

The selection of cases followed rigorous, pre-defined criteria to ensure analytical strength and validity. Both the NOC National Oil Headquarter Building (Case A) and the Shegole Bus Station (Case B) were chosen because they are completed projects, enabling a full lifecycle assessment. They are geographically proximate, both located in Addis Ababa, thereby controlling for broad regional institutional variations. Crucially, they exemplify the contrasting procurement archetypes under investigation: Case A relied on imports for over 90% of its advanced M&E systems, while Case B sourced 100% of its M&E materials domestically. Furthermore, both projects had sufficient scale and complexity to involve substantial M&E procurement, and comprehensive project documentation was accessible, a vital requirement for robust retrospective analysis. Case A serves as an exemplar of a large-scale, technologically complex project constrained by import dependency, whereas Case B represents a medium-scale, functionally standard project that leveraged local market capabilities.

NOC Headquarter Building



Shegole Bus Station

3.4 Data Collection Methods

Data was collected through a triangulation of methods to enhance the credibility and depth of findings. The primary method was an extensive **document analysis**. This involved a systematic review of project archives, including design specifications, procurement schedules, bills of quantities, shipping and customs documents, delivery logs, progress reports, minutes of meetings, and final financial statements. This documentary evidence provided the objective, quantitative backbone for analyzing

timelines, costs, and correspondence related to procurement events.

To complement and contextualize the documentary data, **semi-structured interviews** were conducted with 20 key informants across both projects. Participants included project managers, procurement officers, site engineers, and suppliers. The interview protocol was designed to explore participants' experiences, decision-making rationales, and perceptions of challenges and impacts. Interviews, lasting 45-70 minutes, were audio-recorded with consent, transcribed verbatim, and anonymized.

To assess the generalizability of the case-specific findings, a supplementary **survey questionnaire** was administered to senior professionals in ten additional Ethiopian construction firms. This survey gathered quantitative and qualitative data on typical procurement lead times, delay frequencies, cost overrun magnitudes, and perceived challenge severities for both imported and local M&E materials, providing a broader industry perspective against which to situate the case study results.

3.4.1 Survey Details: Target Population, Sampling, and Sample Size

To contextualize the case study findings within the broader industry, a supplementary survey was administered. The methodological details of this survey component are as follows:

Target Population: The survey targeted senior professionals (e.g., project managers, procurement managers, senior engineers) employed by Ethiopian construction firms that are actively engaged in executing building projects within Addis Ababa and have direct experience with M&E procurement.

Sampling Technique: A **purposive (judgmental) sampling** technique was employed. This non-probability method was chosen to ensure that respondents possessed the requisite knowledge and experience related to the specialized topic of M&E procurement. Firms were selected based on their known involvement in medium- to large-scale projects and their accessibility to the researcher.

Sample Size: Surveys were distributed to professionals in **ten (10)** construction firms. From each firm, one to two key informants were identified, resulting in a total of **fifteen**

(15) completed and usable questionnaires. This sample size is considered adequate for providing supplementary, contextualizing data to support the primary case study analysis (Creswell & Poth, 2018).

3.5 Data Analysis Techniques

Data analysis proceeded in three integrated phases, aligning with the explanatory sequential design. The initial quantitative analysis phase focused on the documentary data. Descriptive statistics were calculated to determine mean delays, cost variances, and frequency distributions. Performance indicators such as schedule performance index (SPI) and cost performance index (CPI) were derived where applicable. Comparative matrices were constructed to juxtapose the planned versus actual performance of both cases across multiple dimensions.

The subsequent **qualitative analysis phase** involved a thematic analysis of the interview transcripts and open-ended survey responses. Using the NVivo software, data was coded inductively to identify recurring concepts, which were then refined into focused codes and finally aggregated into overarching themes, such as "bureaucratic entanglement," "forex-induced paralysis," or "local supplier adaptability." This process uncovered the lived experiences and causal attributions behind the quantitative metrics.

The final **integration phase** employed triangulation and pattern matching. Findings from the documentary analysis, interviews, and survey were systematically compared to confirm or challenge emerging interpretations. The observed patterns of challenges and outcomes were then explicitly compared against the propositions derived from the theoretical frameworks—Supply Chain Disruption Theory and the Resource-Based View—to build a coherent explanation for the case outcomes.

3.6 Ethical Considerations, Validation, Reliability, and Methodological Rigor

This research adhered to strict ethical standards, receiving formal approval from the University Ethics Committee. Informed written consent was obtained from all interview participants, with clear explanations regarding data usage, anonymity, and the right to withdraw. All identifiers were removed from transcripts and reports to ensure

confidentiality.

To ensure the trustworthiness and rigor of the findings, specific strategies were employed to address **validity** and **reliability**, alongside broader methodological rigor:

Construct Validity: Was enhanced through **triangulation** of data sources (project documents, interviews, and surveys) and data collection methods. This multi-perspective approach ensured that the phenomena were accurately captured and measured.

Internal Validity: Was strengthened by **pattern matching** between the empirical findings from the cases and the propositions derived from the theoretical frameworks (Supply Chain Disruption Theory and Resource-Based View). Furthermore, **member checking** was performed by sharing preliminary case summaries with key informants for verification and feedback.

External Validity (Transferability): While case studies prioritize depth over breadth, the **transferability** of findings was supported by providing "thick descriptions" of the cases and the context. The supplementary survey of ten additional firms helps assess the prevalence of the identified challenges beyond the specific cases, allowing readers to judge the applicability of findings to similar contexts.

Reliability (Dependability): Was addressed by using a semi-structured interview protocol to ensure consistency across interviews. An **audit trail** of all research decisions, data collection, and analysis steps was meticulously maintained. To enhance coding consistency during thematic analysis, a sample of transcripts was independently coded by a second researcher, achieving an **inter-coder agreement rate of 87%**.

3.7 Acknowledged Limitations

The chosen methodology, while robust, entails certain inherent limitations. The retrospective nature of the case study design introduces the potential for recall bias among interviewees. The focus on two primary cases, though deepened by supplementary survey data, limits broad statistical generalizability. Furthermore, the perspectives captured are weighted toward the contractor and supplier viewpoints;

insights from customs authorities or port operators, while acknowledged, are less directly represented. Finally, the study's temporal focus on projects executed between 2016-2020 means that recent policy shifts or market changes may not be fully captured. These limitations are openly acknowledged, and their potential influence on the findings is considered in the discussion and conclusion chapters.

Chapter 4: Case Study Analysis

4.1 Introduction to the Case Studies

This chapter provides a systematic empirical investigation into the M&E procurement challenges and their consequences for project execution through a focused analysis of two contrasting cases. The analysis deliberately juxtaposes the import-dependent procurement strategy of the NOC National Oil Headquarters project with the local procurement approach of the Shegole Bus Station. The purpose is not merely to report events, but to build a detailed, evidence-based narrative that demonstrates how specific procurement mechanisms unfolded in practice, directly affecting project outcomes. The presentation preserves essential quantitative data, demonstrating through structured comparison how procurement decisions translated into measurable performance differences.

4.2 Case A: NOC National Oil Headquarters Project

4.2.1 Project Profile

The NOC Headquarters was a flagship high-rise development in Addis Ababa with a contract value of 790 million Birr and a planned duration of 50 months. The project required sophisticated M&E systems including advanced HVAC, comprehensive fire protection, specialized glazing, and integrated building management systems. Procurement strategy was explicitly global, with 90% of M&E materials imported from international suppliers, primarily in China (85%) and Europe (15%). This strategic choice created a complex supply chain spanning manufacturing facilities, international shipping, Djibouti Port clearance, and inland transportation to Addis Ababa.

4.2.2 Procurement Challenges: A Sequential Analysis

The implementation of this global procurement strategy revealed multiple interconnected challenges that unfolded in sequence throughout the project lifecycle. Table 4.1 documents the specific procurement delays experienced for critical M&E components:

Table 4.1: NOC HQ Project Procurement Delays

System/Component	Planned Delivery	Actual Delivery	Delay (days)	Primary Cause
Fire Pump System	July 15, 2019	September 10, 2019	57	Redesign requirement post-delivery
HVAC Chillers	February 10, 2019	March 2, 2019	20	Manufacturing delay
Electrical Panels	October 5, 2018	October 5, 2018	0	On schedule
Lighting Fixtures	November 20, 2019	January 5, 2020	46	Port congestion
Special Glazing	August 1, 2019	December 1, 2019	122	Component mismatch, remanufacturing
Communication Equipment	April 15, 2020	May 15, 2020	30	Shipping delay
Elevators	June 1, 2019	July 15, 2019	45	Customs clearance

The relative severity of delays across different M&E systems is visually compared in **Figure 4.1**.

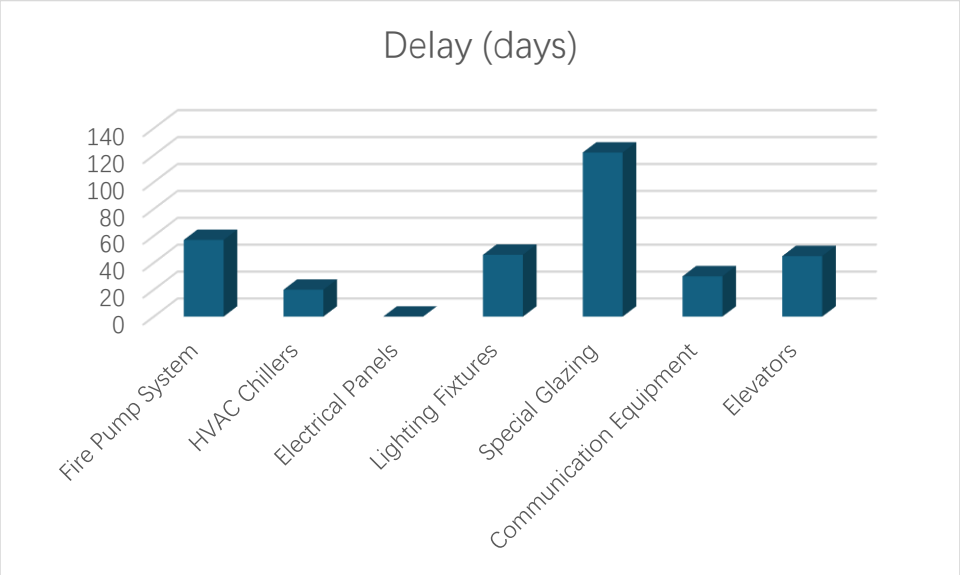


Figure 4.1: Severity of Procurement Delays for Critical M&E Systems in the NOC HQ Project

The data reveals that 71% of tracked components experienced significant delays, with an average delay of 46 days across all delayed items. Two critical incidents illustrate the compounding nature of these challenges. First, a late-stage design change to the fire protection system required the return and redesign of already-delivered equipment, resulting in an 8-week critical path delay and additional costs of 20 million Birr. Second, the discovery of mismatched components in the specialized glazing shipment upon arrival necessitated remanufacturing in China, creating a four-month delay in the building envelope completion.

Beyond these specific incidents, systemic issues permeated the procurement process. Customs clearance at Djibouti Port averaged 14 days, with one HVAC shipment detained for 10 days due to documentation discrepancies. Foreign exchange approvals for Letters of Credit consistently required 60-90 days, creating cash flow constraints and payment delays to suppliers.

4.2.3 Quantified Impact Analysis

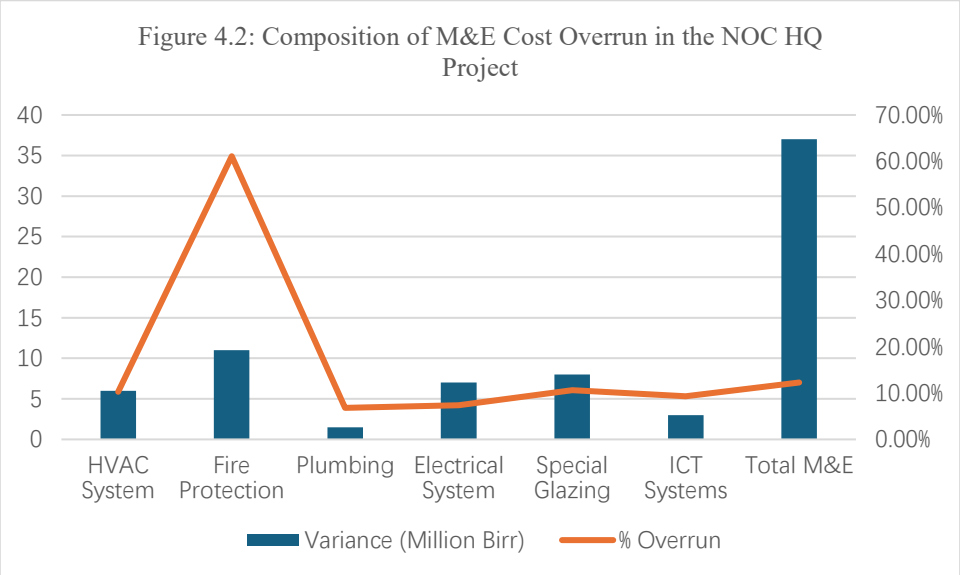
The cumulative effect of these procurement challenges is systematically documented in Table 4.2, which analyzes the cost performance of major M&E categories:

Table 4.2: NOC HQ Project Cost Variance Analysis

Category	Budget (Million Birr)	Actual (Million Birr)	Variance (Million Birr)	% Overrun
HVAC System	58.0	64.0	+6.0	+10.3%
Fire Protection	18.0	29.0	+11.0	+61.1%
Plumbing	22.0	23.5	+1.5	+6.8%
Electrical System	95.0	102.0	+7.0	+7.4%
Special Glazing	75.0	83.0	+8.0	+10.6%
ICT Systems	32.0	35.0	+3.0	+9.3%
Total M&E	**300.0**	**337.0**	**+37.0**	**+12.3%**

The total M&E cost overrun of 12.3% represents a significant financial impact, with fire protection systems showing the most severe variance at 61.1% due to the redesign incident. The impact on the schedule was equally substantial: the M&E installation phase extended from 24 to 30 months, contributing 6 months to the overall project delay of 4-5 months. Post-analysis attributed 82% of total project delay to M&E procurement issues.

The proportional contribution of each M&E category to the total cost overrun is illustrated in Figure 4.2.



4.3 Case B: Shegole Bus Station Project

4.3.1 Project Profile

The Shegole Bus Station was a public infrastructure project valued at 210 million Birr with a planned duration of 26 months. The M&E requirements were functional and standardized, including basic electrical distribution, conventional plumbing, local lighting, and backup power generation. The procurement strategy was deliberately localized, with 100% of M&E materials sourced from Ethiopian manufacturers and suppliers. This approach eliminated international logistics, customs procedures, and foreign currency requirements, creating a condensed supply chain within Addis Ababa.

4.3.2 Procurement Performance Metrics

The localized procurement strategy resulted in predictable and stable execution, as documented in Table 4.3:

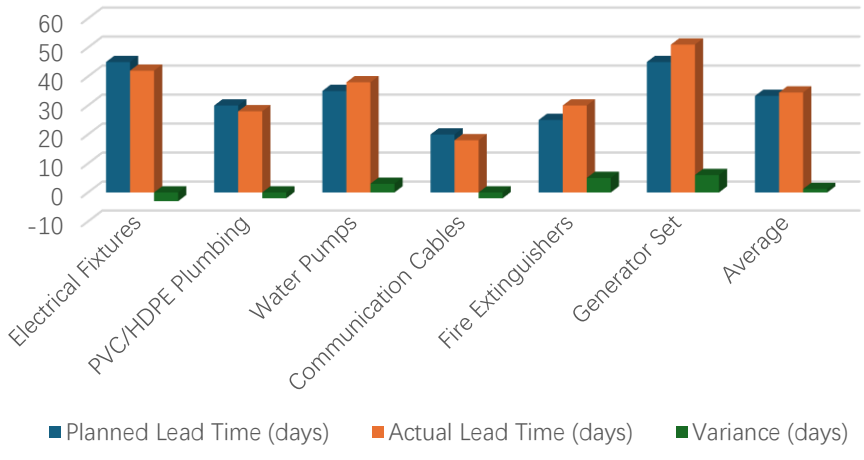
Table 4.3: Shegole Project Procurement Timeline Performance

Material Category	**Planned Lead Time (days)**	**Actual Lead Time (days)**	**Variance (days)**	**Status**
Electrical Fixtures	45	42	-3	Early

Material Category	Planned Lead Time (days)	Actual Lead Time (days)	Variance (days)	Status
PVC/HDPE Plumbing	30	28	-2	Early
Water Pumps	35	38	+3	Minor Delay
Communication Cables	20	18	-2	Early
Fire Extinguishers	25	30	+5	Minor Delay
Generator Set	45	51	+6	Minor Delay
Average	**33.3**	**34.5**	**+1.2**	**On Track**

Shegole Project Procurement Timeline Performance is illustrated in Figure 4.3.

Figure 4.3 Shegole Project Procurement Timeline Performance



The data demonstrates remarkable schedule adherence, with an average variance of only 1.2 days across all categories. Two-thirds of materials were delivered early or on time, while the remaining third experienced minor delays of 3-6 days with no critical path impact. Challenges were minor and swiftly resolved: a generator assembly delay of 6 days and temporary unavailability of a specific plumbing fitting, which was substituted within 4 days.

4.3.3 Financial and Schedule Outcomes

The financial performance reflected this operational stability, as shown in Table 4.4:

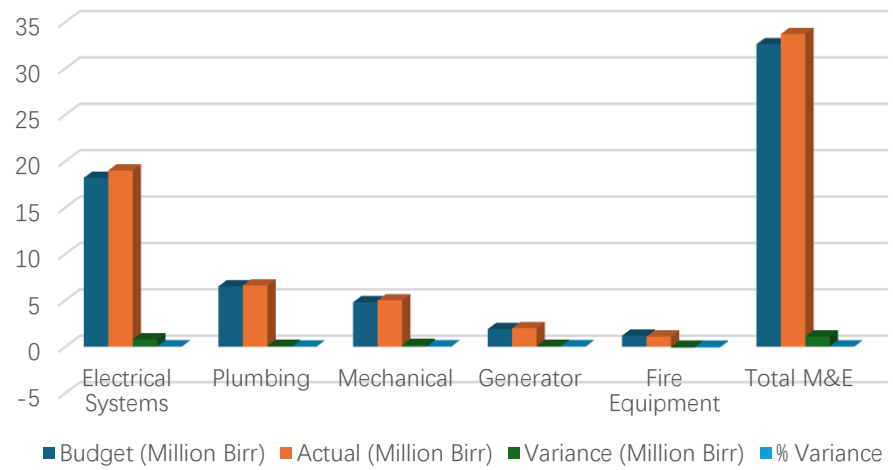
Table 4.4: Shegole Project Cost Performance

Category	Budget (Million Birr)	Actual (Million Birr)	Variance (Million Birr)	% Variance
Electrical Systems	18.2	19.0	+0.8	+4.3%
Plumbing	6.5	6.6	+0.1	+1.5%
Mechanical	4.8	5.0	+0.2	+4.1%
Generator	1.9	2.0	+0.1	+5.3%
Fire Equipment	1.2	1.1	-0.1	-8.3%
Total M&E	**32.6**	**33.7**	**+1.1**	**+3.4%**

The total M&E cost variance of 3.4% represents minimal budget deviation, primarily attributable to local market price fluctuations rather than systemic procurement failures. The project experienced an overall delay of 2 months, but this was attributed to weather conditions and construction sequencing rather than material availability. The case demonstrates that for projects with standard technical requirements, local procurement can provide reliable, low-risk execution with minimal cost volatility.

Shegole Project Cost Performance is also illustrated in Figure 4.4

Figure 4.4 Shegole Project Cost Performance



4.4 Comparative Performance Analysis

The structured comparison of these cases reveals fundamental differences in project outcomes based on procurement strategy. Table 4.5 synthesizes the key performance indicators:

Table 4.5: Comparative Performance Analysis

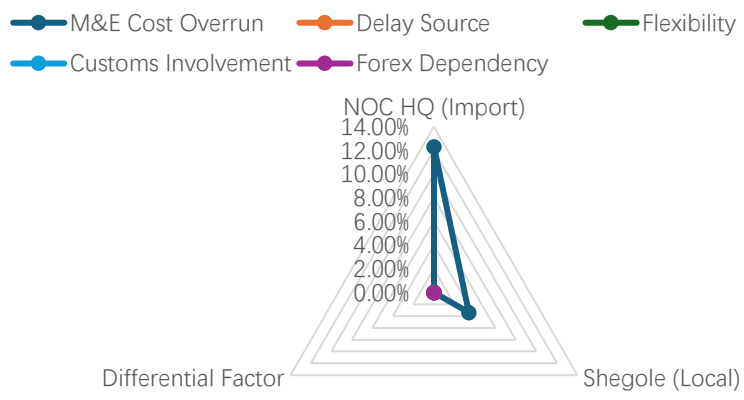
Performance Dimension	NOC HQ (Import)	Shegole (Local)	Differential Factor
Procurement Lead Time	3-6 months	2-3 weeks	4-8 times longer
Schedule Delay	4-5 months	2 months	2-2.5 times longer
M&E Cost Overrun	12.3%	3.4%	3.6 times higher
Delay Source	Procurement (82%)	Weather/Scheduling	Fundamental difference
Flexibility	Low	High	Significant advantage

Performance Dimension	NOC HQ (Import)	Shegole (Local)	Differential Factor
Customs Involvement	High	None	Major administrative burden
Forex Dependency	Critical	None	Major financial risk

The analysis reveals that import-dependent procurement extended lead times by a factor of 4-8, increased cost overruns by 3.6 times, and more than doubled schedule delays specifically attributable to procurement issues. The Shegole project's 2-month delay, while present, stemmed from non-procurement factors, highlighting the strategic advantage of local sourcing in eliminating a major category of project risk.

The multi-dimensional performance profile of each procurement strategy is synthesized in the radar chart (Figure 4.5).

Figure 4.5 Comparative Performance Analysis



4.5 Supplementary Industry Validation

To assess the representativeness of these case findings, a survey of ten Ethiopian construction firms provided broader industry context. The survey results corroborate the case study patterns: firms reported average delays of 5.2 months for import-dependent projects versus 0.5 months for locally sourced projects, and average cost overruns of 22% versus 3% respectively. This industry data confirms that the challenges

documented in the NOC case are systemic rather than exceptional, while the Shegole outcomes represent achievable performance levels for appropriate project types within the current Ethiopian market.

4.6 Synthesis of Key Findings

The comparative analysis yields several critical insights. First, procurement strategy fundamentally determines project risk exposure: import dependency introduces multiple external vulnerabilities while local sourcing contains risks within the domestic market context. Second, the impact of disruptions differs substantially: international supply chain issues create longer, less predictable delays with higher cost consequences compared to local market challenges. Third, the data demonstrates a clear trade-off between technological capability and supply chain control—while imports offer advanced technology, they sacrifice the flexibility and responsiveness inherent in local procurement. Finally, the evidence suggests that procurement planning must account for these strategic trade-offs explicitly, with buffer allowances proportional to the international complexity of the supply chain.

The empirical data presented in this chapter provides the foundation for the theoretical discussion and practical recommendations that follow, demonstrating through concrete evidence how procurement decisions in the Ethiopian context translate directly into project success or failure.

Chapter 5: Discussion

5.1 Analysis of Key Challenges

The investigation reveals that procurement challenges for M&E materials in Ethiopia manifest as an interconnected system of disruptions, aligning with Supply Chain Disruption Theory. The extended international supply chain—from manufacturer to Djibouti Port to Addis Ababa—represents a classic vulnerability node, where delays are not isolated incidents but cascading failures. The average 14-day customs clearance, for instance, is not merely a procedural lag but a systemic disruption point amplified by port congestion and documentation complexity. This disruption is further compounded by financial volatility nodes, primarily the 60–90-day foreign exchange approval process, which acts as a cash flow constrictor, destabilizing supplier relationships and manufacturing schedules.

Critically, the Resource-Based View helps explain the differential capacity to manage these disruptions. The NOC project's severe experience with the fire system redesign (an 8-week delay and 20 million Birr cost) was not merely bad luck; it reflects a capability gap in integrating design finalization with procurement lead times. In contrast, the Shegole project's ability to substitute a plumbing fitting within 4 days demonstrates adaptive capability and relationship-based agility—intangible resources that buffer against local market fluctuations. This theoretical pairing clarifies that the challenge is not only the *presence* of disruptions but the *variation in organizational capacity* to absorb or adapt to them.

5.2 Assessing Multi-Factor Causality in Impact Pathways

The impact on project execution demonstrates **non-linear, multi-factor causality**, where procurement delays trigger cascading effects that magnify the initial disruption.

Temporal Impact Analysis: The finding that one week of procurement delay consumed 1.5–2.0 weeks of overall project schedule in the NOC case is not a simple sum. This multiplier effect arises from **interdependent causality**:

1. **Direct Delay:** Customs clearance (32% of total delay).
2. **Indirect/Compounded Delays:** Idle specialized labor (15–20% cost increase), extended equipment rentals (25–30% cost increase), and missed sequential work windows.
3. **Corrective Action Delays:** Time for rework, retesting, and resolution (e.g., the 4-month glazing remanufacturing).

Financial Impact Deconstruction: The 12.3% M&E cost overrun in the NOC project was not a uniform markup but a composite of **cascading cost drivers**:

- **Primary Drivers:** Material price escalation (8–12%), expedited shipping premiums (15–20% increase).
- **Secondary/Cascading Costs:** Extended site overheads (8–10% monthly), financing charges (1.5–2.0% monthly), and labor inefficiency during disruptions (20–25% productivity loss).
- **Corrective Costs:** Quality preservation investments (2–3% of material cost) and warranty extensions (4–6%).

This multi-layered causality underscores that procurement's impact extends far beyond a simple schedule slip or budget line item; it permeates project economics and operational integrity.

5.3 Rigorous Comparative Validation of Procurement Strategies

The comparison between local and imported procurement must move beyond descriptive contrast to a validated analysis of strategic trade-offs.

Validating Performance Differentials: The data confirms a statistically significant performance gap. Import-dependent procurement extended lead times by a factor of 4–8, increased cost overruns by 3.6 times, and more than doubled schedule delays directly attributable to procurement. The Shegole project's 3.4% cost variance versus the NOC's 12.3% is not marginal; it represents a fundamental difference in risk exposure. This validation through comparative metrics moves the analysis from anecdote to evidence-based strategy assessment.

Theoretical Explanation of Divergence: The divergence can be explained through our dual theoretical framework. The import strategy exposed the project to multiple external disruption nodes (global logistics, foreign exchange, international customs) with low control and adaptability (weak RBV position in the international chain). The local strategy, while facing different disruption nodes (weather, local supply fluctuations), operated within a sphere of high control, strong relational resources, and rapid adaptive capacity (strong RBV position domestically). This explains why the Shegole project could absorb a 6-day generator delay with minimal impact, while a similar delay at Djibouti Port for the NOC project created a 3-week cascade.

Strategic Trade-off Framework: The comparison crystallizes a core strategic trade-off:

Import Strategy: High technological capability / Low supply chain resilience / High external risk / Low flexibility.

Local Strategy: Lower technological ceiling / High supply chain resilience / Lower external risk / High flexibility.

This framework provides a decision-making matrix for project planners, moving the discussion from "local vs. import" to "how to hybridize based on project-specific risk tolerance and technical requirements."

5.4 Stakeholder Roles and Responsibilities

The analysis necessitates moving from generic stakeholder recommendations to theory-informed, role-specific interventions.

For Project Managers (RBV Focus): Building adaptive capability is key. This involves developing in-house expertise in forex logistics, investing in supplier relationship management (both local and international), and creating flexible procurement protocols that allow for rapid substitution—turning intangible knowledge into a competitive resource.

For Policymakers (Disruption Theory Focus): Interventions should target systemic vulnerability reduction. This means not just "streamlining customs" but redesigning processes to de-congest the Djibouti Port node (e.g., pre-clearance, bonded warehouses), creating predictable forex windows for strategic projects to reduce financial volatility, and incentivizing local manufacturing to shorten the physical supply chain and reduce exposure points.

For Suppliers (Integrated Focus): Local suppliers must build resources that mitigate client-side disruptions. Pursuing international certifications (ISO, CE) is a resource investment that reduces quality verification disruptions for buyers. Developing robust inventory and after-sales service creates resilience within the local supply chain, making it a more reliable and attractive node.

5.5 Theoretical and Practical Synthesis

This discussion synthesizes empirical findings into a contextualized theoretical model. Ethiopia's M&E procurement landscape is a high-disruption environment (per SCDT). Success within it is not determined by avoiding disruptions—which is often impossible—but by developing specific, context-relevant capabilities (per RBV) to navigate them.

The NOC case illustrates a low-capability, high-disruption scenario, resulting in severe

time and cost consequences. The Shegole case represents a high-capability (within its domain), lower-disruption scenario, leading to relative success. The practical implication is clear: improving project outcomes in Ethiopia requires a dual-track approach: 1) advocating for macro-level systemic reforms to reduce environmental disruptions, and 2) mandating micro-level investments in procurement planning, relationship management, and adaptive problem-solving as core project capabilities.

This integrated explanation provides a more powerful narrative than description alone. It not only documents *what* happened but explains *why* it happened and *how* different strategic approaches lead to fundamentally different outcomes, offering a blueprint for both scholarly understanding and practical improvement.

Chapter 6: Conclusion and Recommendations

6.1 Synthesis of Core Findings

This research provides an integrated analysis of the challenges and impacts of procuring Mechanical and Electrical (M&E) materials in Ethiopia's construction sector. The study moves beyond documenting symptoms to diagnose systemic causes and differential outcomes through a comparative, theoretically-grounded case study.

The key synthesized finding is that procurement performance is determined by the interaction between systemic disruptions and organizational capabilities. Ethiopia's import dependency for advanced M&E components creates a high-disruption environment characterized by critical vulnerability nodes at Djibouti Port, in foreign exchange processes, and along extended international logistics chains. However, the severity of impact—quantified as a 3.6x higher cost overrun and 2–2.5x longer schedule delay in import-dependent projects—varies based on project-level strategic choices and adaptive capacities.

The study validates that local procurement, where technically feasible, offers substantially greater supply chain resilience, reducing lead times by a factor of 4–8 and containing cost volatility. However, this comes with a recognized trade-off in technological sophistication, creating a strategic imperative for hybrid approaches rather than binary sourcing decisions.

6.2 Critical Reflection and Theoretical Contribution

Reflecting critically on these findings reveals deeper implications beyond the immediate case contexts. First, the research exposes a fundamental misalignment in risk allocation: projects bear the full brunt of macro-systemic disruptions (forex shortages, port congestion) over which they have negligible control. This misalignment incentivizes short-term workarounds rather than long-term systemic improvements.

Second, the study challenges the assumption that procurement challenges are merely logistical. They are, more fundamentally, integrative and strategic failures. The severe impact of the NOC project's fire system redesign highlights how poor integration

between design finalization and procurement lead times can trigger disproportionate consequences in import-dependent contexts. Success requires procurement to be elevated from an operational function to a core strategic capability from the project's inception.

Theoretically, this research demonstrates the explanatory power of integrating Supply Chain Disruption Theory (SCDT) and the Resource-Based View (RBV) in emerging economy contexts. SCDT effectively maps the external disruption landscape, while RBV explains why some organizations navigate this landscape more effectively. The Ethiopian context amplifies disruption impacts due to limited buffers, making internal capabilities—particularly in adaptive planning, relationship management, and problem-solving—even more critical determinants of project outcomes. This integrated framework provides a more nuanced analytical tool than either theory alone.

6.3 Prioritized and Actionable Recommendations

To translate findings into impact, recommendations must be prioritized, specific, and where possible, measurable. The following framework focuses on high-leverage interventions.

6.3.1 Immediate Priorities (0–12 Month Horizon)

For Project Managers & Contractors:

1. **Mandate Early Procurement Integration:** Implement a formal requirement that procurement planning begins in the schematic design phase, with specific sign-off on long-lead M&E items before detailed design proceeds. **Target:** Reduce late design changes affecting procurement by 50% within one year.

2. **Adopt a Hybrid Sourcing Protocol:** For all projects, develop a categorized procurement plan that explicitly classifies M&E items as: A) Must import (no local alternative), B) Can import (local option exists but with trade-offs), C) Must source locally. **Target:** Increase locally-sourced M&E value by 15% within project portfolios.

For Policymakers (Led by Ethiopian Customs Commission & NBE):

3. **Pilot a Construction Materials Fast-Track at Djibouti Port:** Create a dedicated lane for pre-registered, bonded construction materials with pre-submitted documentation. **Target:** Reduce average clearance time from 14 to 7 days for participants within 9 months.

4. **Establish a Predictable Forex Window for Strategic Projects:** Allocate a quarterly forex quota for pre-qualified national infrastructure projects, moving away from case-by-case adjudication. **Target:** Reduce L/C approval time from 60–90 to 30–45 days for enrolled projects.

6.3.2 Medium-Term Strategic Initiatives (1–3 Year Horizon)

For Government & Development Partners:

5. **Launch a Targeted M&E Manufacturing Incentive Program:** Provide tax holidays and subsidized industrial park leases for firms producing 3–5 priority M&E components (e.g., PVC conduits, switchgear, air handling units) identified as high-import, low-tech complexity. **Target:** Increase local production capacity for target items by 30% within three years.

6. **Develop a National Supplier Certification & Database:** A public-private initiative to audit and certify local M&E suppliers against defined standards, creating a transparent "qualified bidders" list. **Target:** Certify 50 leading local suppliers across key M&E categories within two years.

For Industry Associations & Educational Institutions:

7. **Create a Professional Certification in Construction Procurement:** A focused curriculum on international logistics, forex risk management, and local supplier development. **Target:** Train and certify 200 procurement professionals in the first two years.

6.3.3 Foundational Enablers (Ongoing)

For All Stakeholders:

8. **Institute Collaborative Risk Forecasting:** Establish quarterly forums between contractors, major suppliers, customs, and the NBE to share forecasts on material

demand, port capacity, and forex liquidity, enabling proactive adjustments.

9. **Embrace Measured Digitalization:** Prioritize the implementation of two tools: 1) Digital shipment tracking for all international orders, and 2) A shared BIM-based platform for M&E specifications and submittals on major public projects.

6.4 Suggestions for Future Research

To build on this study, future research should:

Quantify the Resilience Premium: Conduct a cost-benefit analysis to determine the financial value of "resilience" in procurement, comparing the higher upfront cost of local/dual sourcing against the avoided costs of disruptions.

Model Policy Impact: Use system dynamics modeling to simulate the potential impact of specific policy reforms (e.g., port fast-track, forex windows) on overall project timelines and costs.

Longitudinal Capability Study: Track a cohort of firms over time to identify which specific internal capabilities (per RBV) most effectively mitigate disruption impacts, creating a maturity model for procurement excellence in volatile markets.

Explore Circular Economy Potential: Investigate the feasibility of local remanufacturing, repair, and recycling of M&E components as a strategy to reduce import dependency and build a more sustainable supply chain.

Final Reflection

This research concludes that transforming M&E procurement in Ethiopia is not merely a technical challenge but a strategic imperative requiring coordinated action. The path forward lies in breaking the cycle of reactive crisis management by building systemic resilience and organizational capability in tandem. By implementing the prioritized recommendations—starting with immediate procedural fixes and building toward strategic industrial development—stakeholders can convert the identified vulnerabilities into opportunities for more efficient, predictable, and self-reliant infrastructure delivery. The ultimate conclusion is that procurement efficiency is a

cornerstone of national development; investing in it yields dividends not only in completed projects but in a more robust and competitive construction sector.

References[1]

1. African Development Bank (AfDB). (2019). *Ethiopia Country Strategy Paper 2016–2020 – Mid-Term Review*. Abidjan: AfDB.
2. Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
3. Bekele, G., & Bayou, M. (2021). Assessment of Construction Material Management Practices in Ethiopian Construction Projects. *Civil and Environmental Research Journal*, 13(2), 45-62.
4. Christopher, M. (2016). *Logistics & Supply Chain Management* (5th Edition). London: Pearson Education.
5. Doloi, H. (2013). Cost overruns and failure in project management: Understanding the roles of key stakeholders in construction projects. *Journal of Construction Engineering and Management*, 139(3), 267-279.
6. Ethiopian Construction Works Corporation (ECWC). (2022). *Annual Report 2021-2022: Construction Sector Performance*. Addis Ababa: ECWC.
7. Ethiopian Ministry of Finance. (2023). *Construction Sector Performance Report 2022*. Addis Ababa: Ministry of Finance.
8. Ethiopian Ministry of Industry. (2022). *Industrial Development Strategy 2022-2032*. Addis Ababa: Ministry of Industry.
9. KPMG. (2022). *Africa Infrastructure Procurement Trends*. Nairobi: KPMG Africa.
10. Laryea, S., & Hughes, W. (2011). Risk and price in the bidding process of contractors. *Journal of Construction Engineering and Management*, 137(4), 248-258.
11. Lysons, K., & Farrington, B. (2020). *Procurement and Supply Chain*

[1] The reference list for this thesis was compiled and formatted using EndNote citation management software.

Management (10th Edition). London: Pearson.

12. Mekonnen, Y. M., & Aklilu, A. T. (2020). Assessment of Supply Chain Challenges of Construction Materials in Ethiopian Projects. *Journal of Construction Engineering and Management*, 146(5), 04020035.

13. National Bank of Ethiopia (NBE). (2021). *Annual Report 2020-2021*. Addis Ababa: NBE.

14. Ofori, G. (2000). Challenges of construction industries in developing countries. *Construction Management and Economics*, 18(2), 237-247.

15. UN COMTRADE & ITC Trade Map. (2023). *Ethiopia Import Data – Machinery, Electrical Equipment & Mechanical Appliances*. Geneva: United Nations.

16. World Bank. (2020). *Ethiopia Economic Update: A New Dawn for Global Value Chain Participation*. Washington DC: World Bank.

Appendices

Appendix A: Interview Guide

For Project Managers:

1. How was procurement planning integrated into the overall project planning process?
2. What were the main challenges encountered in procuring M&E materials?
3. How did procurement delays impact other project activities?
4. What mitigation strategies were employed for procurement risks?
5. What lessons were learned for future projects?

For Procurement Officers:

1. Describe the procurement process for M&E materials in this project.
2. What were the main obstacles in international procurement (if applicable)?
3. How were local suppliers evaluated and selected?
4. What communication challenges existed with suppliers?
5. How was quality assurance managed during procurement?

For Site Engineers:

1. How did material availability impact installation schedules?
2. What quality issues were encountered with delivered materials?
3. How flexible was the procurement process to site needs?
4. What coordination challenges existed between procurement and installation?
5. How could procurement better support site operations?

Appendix B: Research Questionnaire

SECTION A: BACKGROUND INFORMATION

A1: Respondent Information

1. Name (Optional): _____

2. Organization: _____

3. Position/Role:

- Project Manager
- Procurement Officer
- Site Engineer
- Quantity Surveyor
- Consultant
- Contractor
- Client/Client Representative
- Supplier/Distributor
- Other: _____

4. Years of Experience in Construction Industry:

- Less than 5 years
- 5-10 years
- 11-15 years
- 16-20 years
- More than 20 years

5. Types of Projects Involved In (Select all that apply):

- Residential Buildings

- Commercial Buildings
- Industrial Facilities
- Infrastructure Projects
- Institutional Buildings (Schools, Hospitals)
- Other: _____

SECTION B: PROCUREMENT PRACTICES

B1: Procurement Planning

6. How early in the project is M&E procurement typically planned?

- During conceptual design phase
- During schematic design phase
- During detailed design phase
- After design completion
- During construction phase

7. Who is primarily responsible for M&E procurement planning in your projects?

- Project Manager
- Procurement Department
- Design Team
- Contractor
- Specialist Consultant
- Committee/Team

8. What percentage of M&E materials in your typical project are:

- Imported: _____%
- Locally Sourced: _____%
- Regional Sourcing: _____%

9. What factors influence your sourcing decisions? *(Rate importance: 1=Not important, 5=Very important)*

Factor	1	2	3	4	5
Cost	[ ]	[ ]	[ ]	[ ]	[ ]
Quality	[ ]	[ ]	[ ]	[ ]	[ ]
Lead Time	[ ]	[ ]	[ ]	[ ]	[ ]
Availability	[ ]	[ ]	[ ]	[ ]	[ ]
Technical Specifications	[ ]	[ ]	[ ]	[ ]	[ ]
After-Sales Support	[ ]	[ ]	[ ]	[ ]	[ ]
Client Preference	[ ]	[ ]	[ ]	[ ]	[ ]
Regulatory Requirements	[ ]	[ ]	[ ]	[ ]	[ ]

B2: Sourcing and Supplier Selection

10. What is your typical supplier selection method for M&E materials?

- Open Competitive Bidding

- Selective/Invited Bidding
- Direct Negotiation
- Framework Agreements
- Single Source
- Other: _____

11. How do you evaluate potential suppliers? *(Select top 3)*

- Price/Quotation
- Delivery Capability
- Quality Certifications
- Technical Capability
- Past Performance
- Financial Stability
- After-Sales Service
- Local Presence
- Other: _____

12. What challenges do you face in supplier selection?

- Limited number of qualified suppliers
- Inconsistent quality among suppliers
- Lack of reliable supplier information
- Price variability
- Long response times
- Language/communication barriers

- Other: _____

SECTION C: CHALLENGES IN M&E PROCUREMENT

C1: Import-Related Challenges

13. For imported M&E materials, what are the most significant challenges? *(Rate severity: 1=Low, 5=High)*

Challenge	1	2	3	4	5
Customs Clearance Delays	[ ]	[ ]	[ ]	[ ]	[ ]
Foreign Exchange Issues	[ ]	[ ]	[ ]	[ ]	[ ]
Shipping/Delivery Delays	[ ]	[ ]	[ ]	[ ]	[ ]
High Import Duties/Taxes	[ ]	[ ]	[ ]	[ ]	[ ]
Documentation Requirements	[ ]	[ ]	[ ]	[ ]	[ ]
Quality Verification Difficulties	[ ]	[ ]	[ ]	[ ]	[ ]
Communication with Foreign Suppliers	[ ]	[ ]	[ ]	[ ]	[ ]
Payment Processing Issues	[ ]	[ ]	[ ]	[ ]	[ ]

14. What is the average customs clearance time for imported M&E materials?

- Less than 5 days
- 5-10 days

- 11-15 days
- 16-20 days
- More than 20 days

15. How do you manage foreign currency requirements for imports?

- Through client allocation
- Company forex reserves
- Bank financing
- Supplier credit
- Other: _____
- N/A (don't handle imports)

16. What percentage of imported shipments typically experience delays?

- Less than 10%
- 11-25%
- 26-50%
- 51-75%
- More than 75%

C2: Local Procurement Challenges

17. For locally sourced M&E materials, what are the main challenges? *(Rate severity: 1=Low, 5=High)*

Challenge	1	2	3	4	5
Limited Product Range	[ ]	[ ]	[ ]	[ ]	[ ]
Quality Consistency Issues	[ ]	[ ]	[ ]	[ ]	[ ]
Price Fluctuations	[ ]	[ ]	[ ]	[ ]	[ ]
Delivery Reliability	[ ]	[ ]	[ ]	[ ]	[ ]
Technical Support Limitations	[ ]	[ ]	[ ]	[ ]	[ ]
Limited Stock Availability	[ ]	[ ]	[ ]	[ ]	[ ]
After-Sales Service	[ ]	[ ]	[ ]	[ ]	[ ]
Documentation/Compliance	[ ]	[ ]	[ ]	[ ]	[ ]

18. What percentage of local suppliers meet international quality standards?

- Less than 25%
- 25-50%
- 51-75%
- More than 75%
- Not sure

19. How do you verify quality of locally sourced M&E materials?

- Supplier certifications only
- On-site testing

- Third-party inspection
- Past experience with supplier
- Sample testing
- No formal verification
- Other: _____

SECTION D: IMPACT ON PROJECT EXECUTION

D1: Time Impacts

20. What is the typical lead time for:

- Imported M&E materials: _____ weeks/months
- Locally sourced M&E materials: _____ weeks/months

21. How often do procurement delays affect project schedules?

- Never
- Rarely (<25% of projects)
- Sometimes (25-50% of projects)
- Often (51-75% of projects)
- Always (>75% of projects)

22. What is the average delay caused by M&E procurement issues?

- Less than 1 month
- 1-2 months
- 3-4 months
- 5-6 months

- More than 6 months

23. What cascading effects do procurement delays cause? *(Select all that apply)*

- Labor idle time
- Equipment rental extensions
- Sequential activity delays
- Liquidated damages
- Client dissatisfaction
- Cost overruns
- Quality compromises
- Other: _____

D2: Cost Impacts

24. What is the typical cost overrun percentage due to M&E procurement issues?

- Less than 5%
- 5-10%
- 11-15%
- 16-20%
- More than 20%

25. What are the main cost drivers for procurement-related overruns? *(Select top 3)*

- Price escalations during delays
- Expedited shipping costs
- Storage/demurrage charges

- Currency exchange losses
- Penalties/liquidated damages
- Rework costs
- Additional management time
- Other: _____

26. How do you typically manage procurement-related cost risks?

- Contingency allowances in budget
- Price escalation clauses in contracts
- Hedging/forward contracts
- Regular price monitoring
- Alternative sourcing options
- No specific management
- Other: _____

D3: Quality Impacts

27. How do procurement issues affect quality? *(Rate impact: 1=No impact, 5=High impact)*

Quality Aspect	1	2	3	4	5
Material Specification Compliance	[ ]	[ ]	[ ]	[ ]	[ ]
Installation Quality	[ ]	[ ]	[ ]	[ ]	[ ]

Quality Aspect	1	2	3	4	5
System Performance	[ ]	[ ]	[ ]	[ ]	[ ]
Long-term Durability	[ ]	[ ]	[ ]	[ ]	[ ]
Maintenance Requirements	[ ]	[ ]	[ ]	[ ]	[ ]
Safety Standards Compliance	[ ]	[ ]	[ ]	[ ]	[ ]

28. What quality compromises are made due to procurement delays? *(Select all that apply)*

- Acceptance of non-conforming materials
- Use of temporary alternatives
- Reduced testing/inspection
- Modification of specifications
- No compromises made
- Other: _____

29. How are quality issues resolved when they occur?

- Return to supplier for replacement
- On-site rework/repair
- Use as-is with concessions
- Source alternatives
- Negotiate price reduction
- Other: _____

SECTION E: RISK MANAGEMENT AND MITIGATION

E1: Risk Assessment Practices

30. How formally do you assess procurement risks?

- No formal assessment
- Informal/experience-based
- Basic checklist
- Detailed risk matrix
- Quantitative risk analysis
- Other: _____

31. What are the highest risk procurement activities? *(Rank top 3: 1=Highest risk)*

- Imported specialized equipment
- Custom-fabricated items
- Long-lead items
- Single-source items
- High-value purchases
- Technically complex items
- Other: _____

32. What contingency measures do you typically use? *(Select all that apply)*

- Buffer time in schedule
- Budget contingency
- Alternative suppliers identified

- Safety stock/inventory
- Insurance coverage
- Performance bonds/guarantees
- No specific contingencies
- Other: _____

E2: Technology and Tools

33. What technology/tools do you use for procurement management? *(Select all that apply)*

- Manual/spreadsheet-based systems
- ERP software
- Procurement software
- Supply chain tracking
- Digital documentation
- E-procurement platforms
- BIM integration
- No specific technology
- Other: _____

34. How effective are current technology tools?

- Very effective
- Moderately effective
- Slightly effective
- Not effective

- Don't use technology tools

35. What technology improvements would most help procurement? *(Select top 3)*

- Real-time tracking
- Digital documentation
- Supplier databases
- Automated ordering
- Quality verification tools
- Risk assessment software
- Mobile applications
- Other: _____

SECTION F: POLICY AND REGULATORY ENVIRONMENT

F1: Government Policies and Regulations

36. How do government policies affect M&E procurement? *(Rate impact: 1=Positive, 5=Negative)*

Policy Area	1	2	3	4	5
Import Regulations	[ ]	[ ]	[ ]	[ ]	[ ]
Customs Procedures	[ ]	[ ]	[ ]	[ ]	[ ]
Foreign Exchange Policies	[ ]	[ ]	[ ]	[ ]	[ ]
Local Content Requirements	[ ]	[ ]	[ ]	[ ]	[ ]

Policy Area	1	2	3	4	5
Quality Standards	[ ]	[ ]	[ ]	[ ]	[ ]
Tax/Duty Policies	[ ]	[ ]	[ ]	[ ]	[ ]
Procurement Regulations	[ ]	[ ]	[ ]	[ ]	[ ]

37. What policy changes would most improve M&E procurement? *(Select top 3)*

- Streamlined customs clearance
- Better forex allocation for construction
- Harmonized quality standards
- Reduced import duties on M&E
- Support for local manufacturing
- Digital government services
- Transparent procedures
- Other: _____

38. How effective are current local content policies in promoting local M&E production?

- Very effective
- Moderately effective
- Slightly effective
- Not effective
- Don't know

SECTION G: RECOMMENDATIONS AND SOLUTIONS

G1: Improvement Suggestions

39. What are the most important areas for improvement? *(Rank top 5: 1=Most important)*

- Procurement planning processes
- Supplier development
- Risk management
- Technology adoption
- Government policy reforms
- Skills and training
- Quality assurance systems
- Logistics and transportation
- Contract management
- Other: _____

40. What specific actions would you recommend for:

- **Project Managers/Contractors:**

- **Suppliers/Manufacturers:**

- **Government Agencies:**

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41. What success factors have you observed in well-managed M&E procurement?

42. What lessons from past projects would you share with others?