College of Business and Economics

Mekelle University

Supply Chain Management Practices in the Construction Sector in Ethiopia: Implications for Project Performance

(The Case of CBE Headquarters Building)

Thesis Submitted to Mekelle University, College of Business and Economics, Faculty of Management Studies, Management Program for the Award of the Degree of Master of Business Administration (MBA)

By: Zhao Yunfeng

Principal Advisor: Dr. Hailay Gebretinsae Beyene

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Declaration

I hereby declare that this thesis is my original work and has not been submitted for a degree in any other university. All sources used in this study have been properly acknowledged.

Signature: _____________

Date: December, 2025

Certification

This is to certify that the thesis entitled "Supply Chain Management Practices in the Construction Sector in Ethiopia: Implications for Project Performance" submitted by Zhao Yunfeng in partial fulfillment of the requirements for the award of the degree of Master of Business Administration (MBA), is a bonafide record of the original research work carried out under my supervision and guidance. The thesis represents the candidate's own work, meets the academic standards of Mekelle University, and is suitable for submission and evaluation.

To the best of my knowledge, the content of this thesis has not been submitted in whole or in part for any other degree or qualification at this or any other institution.

Principal Advisor

Name: Dr. Hailay Gebretinsae Beyene
Signature: ______________________
Date: __________________________

Head of Department

Name: _________________________
Signature: ______________________
Date: __________________________

Dean, School of Management

Name: _________________________
Signature: ______________________
Date: __________________________

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Abstract

Supply Chain Management (SCM) plays a vital role in construction project performance, particularly in large and complex projects that rely on diverse materials, specialized equipment, and synchronized coordination among multiple stakeholders. Despite the expansion of Ethiopia's construction industry, significant challenges persist in procurement, logistics, supplier management, and foreign-exchange-dependent importation of materials. Employing a mixed-methods case study design, this research draws on project documentation, survey responses, and interviews with practitioners, alongside a review of global and regional SCM literature, to investigate how procurement planning, supplier relationships, logistics coordination, risk management, and information flow affect time, cost, and quality performance. The CBE Headquarters Project, which experienced a three-year delay primarily due to supply chain constraints, provides the instrumental case context for this analysis. The findings highlight critical SCM challenges including foreign-currency shortages, lengthy customs procedures, import dependency for major materials, and limited use of digital SCM tools. The study proposes practical recommendations aimed at strengthening procurement planning, enhancing supplier integration, improving logistics systems, and adopting digital SCM platforms to boost project performance in Ethiopia's construction industry.

Keywords: *Supply Chain Management, Construction Industry, Project Performance, Procurement, Ethiopia, CBE Headquarters*

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Acronyms and Abbreviations

- **BIM** – Building Information Modeling
- **CBE** – Commercial Bank of Ethiopia
- **CSC** – Construction Supply Chain
- **CSCM** – Construction Supply Chain Management
- **ERP** – Enterprise Resource Planning
- **FX** – Foreign Exchange
- **HVAC** – Heating, Ventilation, and Air Conditioning
- **LC** – Letter of Credit
- **LEED** – Leadership in Energy and Environmental Design
- **MEP** – Mechanical, Electrical, and Plumbing
- **PM** – Project Management
- **PV** – Photovoltaic
- **SCM** – Supply Chain Management

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Chapter 1: Introduction

1.1 Background of the Study

Supply Chain Management (SCM) has become a critical strategic function in modern industries, as it integrates the flow of materials, information, finances, and services across the entire project or product lifecycle (Mentzer et al., 2001). In the construction sector, effective SCM is essential due to the industry's inherently fragmented and project-based nature, involving multiple actors such as contractors, subcontractors, suppliers, designers, consultants, and regulators (Vrijhoef & Koskela, 2000). Coordinating these stakeholders requires significant planning, communication, and resource alignment to ensure timely and cost-effective project delivery.

Globally, construction projects face recurring challenges including cost overruns, schedule delays, and quality issues---many of which stem from weak supply chain coordination, inefficient procurement systems, and unpredictable logistics processes (Flynn et al., 2010; Hosseini et al., 2022). The dynamic and interconnected nature of construction supply chains makes them highly vulnerable to disruptions such as material shortages, supplier unreliability, transportation bottlenecks, and global events that affect manufacturing and logistics.

In developing countries, including Ethiopia, these challenges are further intensified by limited local manufacturing capacity for specialized construction materials, heavy reliance on imported goods, foreign-exchange constraints, and complex customs and clearance procedures (Ofori, 2012; Laryea & Hughes, 2011). As a result, construction projects in Ethiopia frequently experience delays and cost escalations related to supply chain constraints (World Bank, 2020). These structural issues make the adoption of effective SCM practices a crucial pillar for successful construction project delivery.

The Commercial Bank of Ethiopia (CBE) Headquarters Project exemplifies the complexities of managing construction supply chains in Ethiopia. The project features a 209.3-meter-tall main tower with 53 floors, two podium buildings, and extensive underground parking (Original CBE Project Data, 2022). It required procurement of highly specialized materials---including 5,208 unique curtain wall units---sourced from multiple countries (Original CBE Project Data, 2022). The project was originally planned for completion on **19 January 2019**, but was completed on **13 February 2022**, reflecting a delay of more than three years (Original CBE Project Data, 2022). According to project documentation, major causes of delay included foreign currency shortages, delayed issuance of Letters of Credit, international shipping disruptions, and customs clearance delays (Original CBE Project Data, 2022).

Given the increasing scale of construction activities in Ethiopia, understanding and improving SCM practices is vital for enhancing project performance and ensuring the efficient use of financial and human resources. This study uses the CBE Headquarters Project as a case study to examine how SCM practices directly influence project performance in the Ethiopian construction sector.

Here below are the original data and information of the Project presented for better ref erences:

1.1.1. Background and Overview Data of Study Area

Original CBE Project Data

1. Engineering Info of CBE Headquarter

Item	Details
Height	209.3 meters
Total Floor Area	160,000 square meters
Floors (Main Tower)	53 stories (49 above-ground, 1 mezzanine, 1 ground floor, 4 basements)
Building Complex Includes	- 209.3 m main tower - Two 5-story podiums - 20m-deep underground parking (1500 mechanical spaces)
Key Facilities	Offices, conference halls, training centers, restaurants, data center, rooftop helipad
Significance	Tallest Building in Ethiopia and East Africa
Commencement of Construction	27 June 2015
Completion of Construction	13 Feb 2022
Actual Duration	6 years + 7 months
Planned Completion Date	19 January 2019
Reason for Delay	Foreign currency shortage delayed cladding work
Total Cost	$303.5 million
Technology	Modern fire protection, CCTV cameras, energy-saving air-source heat pump
Sustainability	LEED Silver certification for green building practices

2. CBE Headquarters Building Project Schedule & Key Milestones

Phase	Timeframe	Key Milestones & Progress Description
Planning & Design Phase	Early 2014 – June 2015	• Feasibility studies, schematic design, and preliminary design completed. • BIM modeling initiated for structural, curtain wall, and MEP system coordination. • Construction tender, main contractor, and subcontractor agreements finalized. • Site clearance and setup of temporary facilities completed.
Substructure Construction	27 June 2015 – End 2016	• **27 June 2015: Official Project Commencement.** • Deep excavation and shoring for the 20-meter basement. • Construction of the four-level basement structure (waterproofing, foundations, slab, walls, columns). • Structural completion of the underground mechanical parking facility.
Superstructure Construction	Early 2017 – Mid 2018	• Sequential construction of the main tower core and steel structure, averaging 5–7 days per floor. • Simultaneous construction of the two 5-story podium buildings. • **Mid 2018: Main Tower Topping Out** (reaching 209.3 meters).
Curtain Wall	Early 2018	• **Key Challenge:** Manufacturing and installation

Phase	Timeframe	Key Milestones & Progress Description
& Building Envelope	– End 2021 *(Impacted by Delays)*	of 5,208 unique curtain wall units with varying inclinations and sizes. • BIM-derived fabrication drawings used for off-site prefabrication. • **Primary Delay Causes:** - **Foreign Currency Shortage:** From 2018-2019, import delays for curtain wall materials due to Ethiopia's forex shortage. - **COVID-19 Pandemic:** From 2020, global supply chain disruptions, international logistics delays, and restrictions on workforce mobility further exacerbated material delivery and on-site labor deployment. • Originally scheduled for January 2019, installation was not fully completed until end of 2021.
MEP & Internal Systems Installation	Early 2019 – End 2021	• Work progressed in parallel with the curtain wall installation, also affected by supply chain and labor issues. • Installation of the air-source heat pump system, solar lighting system, light sensor control system, fire protection, CCTV security, data center infrastructure, etc. • Preliminary system commissioning conducted.
Interior Finishing &	Early 2020 – End 2021	• Impacted by the pandemic, causing delays in import of finishing materials and constraints on

Phase	Timeframe	Key Milestones & Progress Description
Fit-out		local labor scheduling. • Progressive interior fit-out of offices, conference halls, training centers, restaurants, etc. • Installation and commissioning of mechanical parking systems. • Sectional handovers and system approvals carried out.
Integrated Systems Testing & Final Inspection	Oct 2021 – Jan 2022	• Integrated commissioning and testing of all MEP systems. • Performance testing of energy-saving systems (lighting, heat pump) to verify >30% energy reduction target. • Final review and attainment of LEED Silver certification. • Joint final inspection and acceptance by government authorities and the client.
Project Completion & Handover	February 2022	**• 13 February 2022: Project Construction Completion.** • Final cleaning, snagging, and documentation archiving. • Preparation for handover and inauguration ceremony.
Official Inauguration	17 February 2022	• Ethiopian Prime Minister Abiy Ahmed and the Chinese Ambassador to Ethiopia attended the inauguration ceremony. The building officially

Phase	Timeframe	Key Milestones & Progress Description
		opened for operation.

Key Delay Summary

- **Planned Completion Date:** 19 January 2019
- **Actual Completion Date:** 13 February 2022
- **Total Delay Duration:** Approximately 3 years and 1 month
- **Primary Delay Causes:**
    1. **Foreign Currency Shortage in Ethiopia:** Caused procurement and shipping delays for imported materials like curtain wall units.
    2. **Impact of COVID-19 Pandemic:** From 2020, global supply chain interruptions, international logistics bottlenecks, and restrictions on
    3. workforce mobility significantly slowed construction progress.

Overall Project Duration

- **Actual Construction Period:** 6 years and 7 months (27 June 2015 – 13 February 2022)

Key Project Highlights: Full BIM collaboration, customized curtain wall system, solar + light-sensing intelligent lighting, air-source heat pump, LEED Silver certification, local talent development and job creation (over 3,000 jobs).

3. Major Building Materials List & Supply Chain Schedule

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
Structural Materials	High-Strength Rebar (Grade 60)	45,000 MT	Turkey, China	Mar 2015	May 2015	Jun 2015	Jul 2015	Insufficient local supply, import-dependent. Quality certification pre-approval required for customs.
	Structural Steel (Sections, Plates)	28,000 MT	China, India	Sep 2016	Nov 2016	Jan 2017	Feb 2017	~1-month delay in foreign exchange approval, impacting superstructure start.
	Ready-Mix	320,000	Ethiopia	Batch	N/A	N/A	As per	Local production,

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
	Concrete	m³	(Local)	Orders			schedule	stable supply. Requires tight coordination with pouring schedules.
Curtain Wall System	Custom CW Units (Aluminum/Glass)	5,208 units	China	Jun 2017	Mar 2018	Jun 2018	Aug 2018 (First Batch)	**Major Delay:** 4-month delay in Letter of Credit issuance due to forex shortage. Long manufacturing lead time.
	CW Support Steel	1,200 MT	China	Aug 2017	May 2018	Aug 2018	Oct 2018	Coordinated with CW units, similarly impacted by forex

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
								issues.
	Sealants & Gaskets	80 MT	Germany, USA	Jan 2018	Jul 2018	Oct 2018	Nov 2018	Air freight costs surged during pandemic; partial shift to sea freight.
MEP Equipment	Air-Source Heat Pump Systems	12 sets	USA, China	Dec 2018	Jun 2019	Sep 2019	Oct 2019	Complex specs, long manufacturing lead time. Requires Ministry of Energy certification for clearance.
	Solar PV Panels & Controllers	112 sets	China	Feb 2019	Aug 2019	Nov 2019	Dec 2019	Second batch delayed by 3 months

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
								due to COVID-19 disruptions in early 2020.
	Transformers, HV/LV Switchgear	40 units	Germany, Switzerland	Apr 2019	Oct 2019	Feb 2020	Mar 2020	Port quarantine during pandemic lockdown delayed pickup by 1 month.
	Elevators (Passenger, Service, Fire)	36 units	Finland, Japan	Jun 2018	May 2019	Aug 2019	Sep 2019	Staggered delivery. Installation and commissioning overlapped with structural work.
Finishing	Marble & Granite	85,000	Italy, India	Aug 2019	Jan 2020	May 2020	Jun 2020	COVID-19 caused

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
Materials		m²						quarry shutdowns in India; partial sourcing shifted to Turkey.
	Ceiling Systems (Mineral Wool, Metal)	120,000 m²	China, Malaysia	Mar 2020	Sep 2020	Jan 2021	Feb 2021	Severe sea freight container shortage, freight costs increased by ~300%.
	Carpet & Adhesive	70,000 m²	Belgium, Turkey	May 2020	Nov 2020	Mar 2021	Apr 2021	Incomplete customs documentation caused 2-week port detention, incurring demurrage.

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
Other	Fire Protection Systems (Sprinkler, Alarm)	Full Building System	USA, China	Oct 2019	Apr 2020	Aug 2020	Sep 2020	Some components affected by trade tensions; re-submission for alternative brand approval required.
	Data Center Precision AC Units	8 sets	USA	Feb 2020	Aug 2020	Jan 2021	Feb 2021	Export control risks; resolved via transshipment through Hong Kong, causing 4-month delay.
	Mechanical Parking System	1,500 spaces	South Korea	Nov 2018	Oct 2019	Mar 2020	Apr 2020	Complex installation requires technicians on-site, delayed due

Material Category	Material Name	Quantity	Primary Source Country	PO Placement Date	Departure from Port	Ethiopia Customs Clearance	Arrival at Site	Supply Chain Risks & Notes
								to travel bans.

4. CSCEC Breaking News:

New headquarters building of the Commercial Bank of Ethiopia—the tallest building in East Africa completed

Pubtime:17.02.2022

Recently, new headquarters building of the Commercial Bank of Ethiopia, the highest building in East Africa, was completed. Ethiopian Prime Minister Abiy Ahmed and Chinese Ambassador to Ethiopia attended the inauguration ceremony.

The new headquarters building of the Commercial Bank of Ethiopia was located in the central commercial zone in the capital Addis Ababa. With a total construction area of 160,000 square meters and a height of 209 meters, the building will become a symbolic one in Ethiopia and even East Africa.

The main building was like diamonds and its structure was composed of 5,208 curtain walls, every one being in different inclinations and sizes. The project team produced 3D processing model drawings through BIM modeling to perfectly control the processing accuracy of mounting hooks and to control the accuracy of curtain walls within millimeter-level errors.

Taking fully use of local conditions of a high altitude and abundant sunshine, the builders arranged 112 solar lights outside and 117 light sensors inside. The light system can independently control light levels based on the sunlight and realized an energy saving of more than 30%.

An air-source heat pump instead of the traditional boiler heating system was applied in the project to provide hot water and a water-softening system was added, further reducing energy consumption by about 15%.

The project has obtained the LEED silver certification which boasts the most comprehensive and influential assessment standards among all types of environmental assessments, green building assessments and sustainability assessments in the world.

The project team actively promoted localized management, employing local excellent graduates and workers. Each of them has a teacher to guide them during the training.

In addition, the team trained technical personnel through "inheriting, helping and practicing with guidance". The project provided more than 3,000 jobs in total.

1.2 Problem Statement

Despite the growth of Ethiopia’s construction industry, many projects continue to suffer from delays, cost overruns, and quality shortcomings. While numerous factors contribute to these issues, supply chain-related factors—including material shortages, delayed imports, logistics bottlenecks, poor coordination among suppliers, and inadequate procurement planning—are consistently among the most significant.

The CBE Headquarters Project highlights the severity of these challenges. The project’s heavy dependence on imported materials, combined with foreign currency limitations and slow customs processes, led to significant disruptions in material availability. The onset of the global COVID-19 pandemic further magnified these challenges by causing international shipping delays and increasing the cost and time required for procurement.

These conditions reveal a gap in the effective management of construction supply chai ns in Ethiopia. Without robust SCM strategies, projects remain vulnerable to internal and external disruptions that negatively affect time, cost, and quality performance. Thi s is starkly illustrated by the CBE Headquarters Project itself, which experienced a del ay of over three years (approximately 37 months), significant cost overruns due to ext ended overheads and expedited logistics, and quality risks arising from material handl ing issues and rushed substitutions (Original CBE Project Data, 2022). More broadly, industry analysts suggest that such disruptions in Ethiopia frequently result in project delays exceeding 30% of the planned duration and cost overruns of more than 25% (E thiopian Construction Project Management Association Report, 2023). Hence, a systematic analysis is required to understand the SCM practices used in Ethiopia and evaluate their effectiveness in enhancing project outcomes.

1.3 Research Questions

This study is guided by the following research questions:

1. What supply chain management practices are utilized in the Ethiopian

construction sector?

2. What are the major supply chain challenges affecting construction project performance in Ethiopia?
3. How did SCM practices and constraints influence the performance outcomes of the CBE Headquarters Project?
4. What lessons can be drawn from the CBE case that can inform SCM improvements in future construction projects?
5. What strategies can be recommended to enhance SCM and improve project performance in Ethiopia?

1.4 Objectives of the Study

General Objective

To analyze supply chain management practices in the construction sector and assess their implications for project performance, using the CBE Headquarters Project as a case study.

Specific Objectives

The specific of the objectives of the study as derived from the general objective are as stated below.

- To identify the supply chain management practices used in major construction projects in Ethiopia.
- To examine key supply chain challenges affecting project delivery.
- To assess the impact of SCM practices on the performance of the CBE Headquarters Project.
- To evaluate the relationship between SCM effectiveness and project time, cost, and quality performance.
- To propose recommendations for improving SCM practices in Ethiopia's construction sector.

1.5 Significance of the Study

This study is significant in several ways:

- **For contractors and construction firms:** It provides insights into improving procurement planning, supplier coordination, and logistics management.
- **For clients and project owners:** It highlights the importance of early planning for imports, foreign currency allocation, and supply chain risk mitigation.
- **For policymakers:** It identifies systemic challenges in customs, foreign exchange availability, and logistics infrastructure that require policy-level intervention.
- **For academics:** It contributes to limited empirical research on SCM in Ethiopia's construction sector.
- **For the national economy:** Improved SCM can enhance infrastructure development efficiency and reduce resource wastage.

1.6 Scope and Limitations

Scope

The scope of the study is delimited as briefly described below

- **Geographical scope:** Addis Ababa, Ethiopia.
- **Project scope:** The CBE Headquarters Building Project.
- **Topical scope:** SCM practices including procurement, supplier management, logistics, and risk management, and their influence on project performance.
- **Time scope:** Project duration from 2015 (start of construction) to 2022 (completion).

Limitations

The following are the limitations of the study.

- Access to some confidential procurement documents was somehow restricted.
- Interview responses may contain subjective biases.
- Analysis is based primarily on one major project, which may limit broader generalizability.
- External factors such as macroeconomic changes or global disruptions may have influence on the findings.

1.7 Thesis Structure

This thesis is systematically structured into six chapters to logically guide the reader from problem identification through to conclusions and recommendations.

Chapter One: Introduction establishes the research foundation. It presents the background of the study, articulates the problem statement, formulates the research questions, defines the study's objectives, and discusses its significance. It concludes by outlining the scope and limitations of the research.

Chapter Two: Literature Review provides the theoretical and empirical context. It examines existing knowledge on construction supply chain management, including its core elements, challenges (with emphasis on developing countries), and its established relationship with project performance. This chapter synthesizes relevant theories and prior studies to build a conceptual framework that guides the subsequent investigation.

Chapter Three: Research Methodology details the systematic approach employed to conduct the study. It justifies the chosen mixed-methods and case study design, specifies the target population and sampling techniques, and describes the data collection instruments (questionnaires, interview guides, and secondary data checklists). The chapter also explains the data analysis procedures and addresses issues of validity, reliability, and research ethics.

Chapter Four: Data Presentation and Analysis is the core empirical section. It systematically presents the findings collected from the CBE Headquarters Project case. The chapter is organized thematically to analyze key SCM areas—procurement, supplier management, logistics, information flow, and risk management—and directly assesses their impact on the project's time, cost, and quality performance.

Chapter Five: Discussion interprets the findings from Chapter Four. It contextualizes the results within the established literature reviewed in Chapter Two, highlighting points of alignment, contradiction, or extension. This chapter synthesizes insights to explain how and why the observed SCM practices influenced project outcomes, thereby addressing the core research questions.

Chapter Six: Conclusions and Recommendations provide the culmination of the research. It summarizes the principal conclusions drawn from the study, answers the research questions, and translates the findings into actionable, multi-level recommendations for industry practitioners, policymakers, and future researchers. It also suggests directions for further studies.

Chapter 2: Literature Review

2.1 Introduction to Construction Supply Chain Management (SCM)

This chapter establishes the theoretical and empirical foundation for the study. It moves beyond a mere summation of existing work to provide a critical synthesis and analysis of the literature on Construction Supply Chain Management (SCM). The chapter is structured to first explore the theoretical evolution of SCM, then analyze its core dimensions with a focus on empirical evidence, followed by a specialized review of challenges in developing countries. It culminates in the presentation and justification of the conceptual framework guiding this research and a clear articulation of the research gap. Recent publications (post-2020) are integrated throughout to ensure the review reflects contemporary debates, particularly regarding supply chain resilience and digital transformation.

2.2 The Evolution and Theoretical Foundations of Construction SCM

Construction Supply Chain Management (CSCM) has emerged as a critical field of study precisely because construction differs fundamentally from manufacturing in its temporary, project-based, and fragmented nature, involving a coalition of multiple independent organizations (Vrijhoef & Koskela, 2000). This inherent structure creates unique coordination challenges that theoretical frameworks seek to address. Lean Construction theory (Koskela, 1992), for instance, applies manufacturing-derived principles to eliminate waste in flows and processes, directly targeting inefficiencies in material and information movement. In contrast, Transaction Cost Economics (Williamson, 1981) provides a lens for understanding governance choices, explaining why firms might integrate with suppliers or engage in complex contracting to mitigate the risks of opportunism and uncertainty prevalent in one-off projects. More recently, the paradigm of Supply Chain Integration (Flynn et al., 2010) has gained prominence, emphasizing the performance benefits of collaborative planning, shared information, and aligned incentives across organizational boundaries. The critical analysis here lies in the tension and complementarity between these theories: while Lean focuses on operational efficiency and TCE on governance cost minimization, Integration theory emphasizes relational capital and joint value creation. Effective CSCM in complex projects like the CBE

Headquarters likely requires a blend of all three perspectives—optimizing processes, designing appropriate contracts, and fostering collaboration.

2.3 Core Dimensions of Construction SCM: A Synthesis of Best Practices and Empirical Evidence

A deep analysis of the literature reveals that effective CSCM can be deconstructed into several interdependent dimensions, each supported by a body of empirical research.

2.3.1 Procurement Planning and Strategic Sourcing

Procurement represents 60–70% of total project cost, making its planning a decisive factor for success (Dainty et al., 2001). Best practices advocate for early supplier involvement (ESI) and framework agreements to align design with supply capabilities and mitigate risks (Eriksson, 2010). **Empirically**, poor procurement planning is consistently linked to delays. A study by Doloi et al. (2012) in the Indian context identified inaccurate material forecasting and late ordering among the top five causes of schedule overruns. This is exacerbated for long-lead items, where a lack of early identification creates irreversible bottlenecks (Meng, 2012).

2.3.2 Supplier and Subcontractor Management

Moving from transactional to relational contracting is a well-established prescription (Briscoe & Dainty, 2005). **Empirical evidence** substantiates this: projects employing partnership-based models report fewer disputes, higher innovation, and better schedule reliability compared to those relying on competitive tendering alone (Eriksson, 2010). However, the challenge of managing multiple subcontractors remains acute. Research by Doloi et al. (2012) highlights that poor coordination and communication with subcontractors are leading causes of workflow disruptions, indicating that relational principles must be actively managed across the entire supply network, not just with first-tier suppliers.

2.3.3 Logistics and Material Flow Management

Logistics is the physical execution of the supply chain plan. Vrijhoef and Koskela (2000) positioned it as one of the four key roles of SCM in construction. **Empirical studies quantify its impact**: Sullivan (2017) found that logistics inefficiencies can account for up to 10% of lost labor productivity on-site due to trades waiting for materials, poor site layout, and double-handling. This translates directly into cost overruns and delays. Recent work emphasizes the concept of "Construction Logistics Management" (CLM) as a dedicated function to plan, control, and optimize these flows (Teixeira et al., 2021).

2.3.4 Information Flow, Communication, and Digital Integration

The fragmented nature of construction makes information asymmetry a major risk. London (2009) argues that ineffective information flow is a primary root cause of rework and misalignment. **Empirical support** comes from studies on Building Information Modeling (BIM) and other digital tools. For example, research indicates that BIM-enabled projects experience significantly fewer clashes and reduce request-for-information (RFI) cycles, leading to time and cost savings (Azhar, 2011). However, adoption remains uneven. **A critical analysis point** is the gap between the potential of integrated digital platforms (e.g., cloud-based project management, IoT tracking) and their practical, widespread use in many regions, particularly in developing countries where traditional communication methods (e.g., paper, sporadic meetings) still dominate (Hosseini et al., 2022).

2.3.5 Risk Management and Resilience

Traditional risk management focuses on identifying and mitigating known risks. However, recent global disruptions have foregrounded the need for **supply chain resilience**—the ability to anticipate, prepare for, respond to, and recover from disruptions (Hosseini et al., 2022). **Empirical studies** post-2020 have analyzed the impact of the COVID-19 pandemic, revealing that projects with diversified sourcing, strategic buffer stock, and flexible contracts fared significantly better than those without (Shekarian et al., 2022). This dimension has evolved from a peripheral concern to a central strategic imperative for CSCM, especially for import-dependent projects in volatile environments.

2.4 SCM Challenges in Developing Countries: An Empirical Focus

The general challenges of CSCM are magnified in developing countries due to systemic constraints. **Empirical research** from Africa and similar contexts provides concrete evidence of these amplified difficulties:

2.4.1 Import Dependency & Foreign Exchange: Studies consistently cite heavy reliance on imported materials as a critical vulnerability. Ofori (2012) notes that in Ghana, fluctuations in currency exchange rates and delays in securing foreign exchange are among the most significant causes of cost escalation. The CBE case, with over 70% high-value materials imported, exemplifies this extreme dependency.

2.4.2 Logistics and Infrastructure Bottlenecks: Research by Laryea and Hughes (2011) details how poor port efficiency, cumbersome customs procedures, and unreliable inland transportation in West Africa extend lead times unpredictably. These are not occasional issues but **systemic bottlenecks** that add months to project schedules, as corroborated by the CBE project's procurement logs.

2.4.3 Limited Local Capacity and Institutional Gaps: A lack of qualified local suppliers for specialized components forces international sourcing, increasing complexity (Ofori, 2012). Furthermore, weak regulatory frameworks and institutional inefficiencies add layers of administrative risk rarely discussed in literature from developed economies.

2.5 The Impact of SCM on Project Performance: Establishing the Causal Link

A substantial body of **empirical research** has sought to establish and quantify the causal relationship between SCM effectiveness and project success. The following synthesis demonstrates this link across the "Iron Triangle" of performance:

SCM Dimension	Representative Empirical Study	Key Finding on Project Performance	Context
Procurement & Supplier Integration	Meng (2012)	Significant positive correlation between supply chain integration and both time and cost	Cross-sector study

SCM Dimension	Representative Empirical Study	Key Finding on Project Performance	Context
		performance.	
	Eriksson (2010)	Collaborative procurement models improve schedule reliability and reduce transaction costs.	Swedish construction
Logistics Management	Sullivan (2017)	A 10% improvement in logistics efficiency can reduce equivalent project duration by 5-7%.	Large-scale projects
Information Flow	Azhar (2011)	BIM adoption reduces rework and improves coordination, leading to cost savings of 1-3% of project value.	Case studies (US)
Risk/Resilience	Shekarian et al. (2022)	Projects with formal resilience strategies experienced 30-50% lower schedule impacts from COVID-19 disruptions.	Global survey

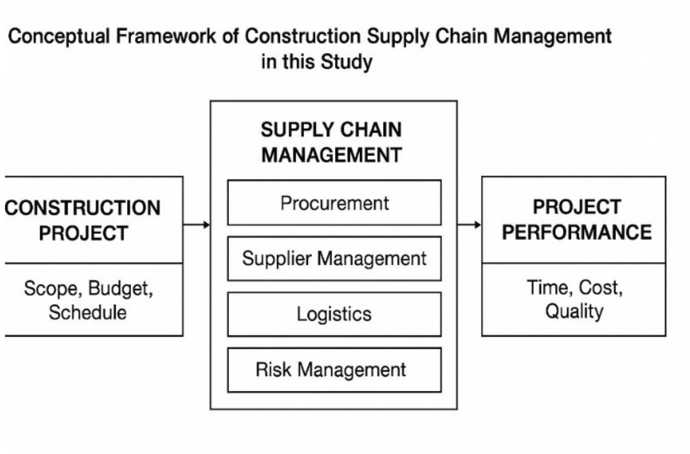
Table 2.1: Empirical Evidence Linking SCM to Project Performance

This table synthesizes evidence that weak SCM practices are not just correlated with but are **causal factors** in poor performance. The findings consistently point to integration, coordination, and proactive risk management as levers for achieving better schedule adherence, cost control, and quality outcomes.

2.6 Conceptual Framework Adopted for This Study

The preceding synthesis of literature reveals that Construction Supply Chain Management (CSCM) is a multi-dimensional discipline whose effectiveness is contingent upon both internal managerial practices and external contextual factors. To systematically investigate the phenomenon within the Ethiopian context, this study develops and adopts the integrated conceptual framework presented in **Figure 2.1**. This framework is not merely an organizational tool but a research model that explicates the presumed relationships between key variables, derived directly from the empirical and theoretical foundations discussed earlier.

Figure 2.1: Conceptual Framework of Construction Supply Chain Management i n This Study



2.6.1 Justification of the Five Core SCM Dimensions

The framework posits five interdependent SCM dimensions as the independent variables influencing project performance. Their selection is justified as follows:

1. **Procurement Planning:** Extending the arguments of Dainty et al. (2001) and Eriksson (2010), this dimension is positioned as the foundational activity. In import-dependent contexts, late or misaligned procurement is a primary cause of cascading delays, making its early and strategic planning a critical predictive variable for project schedule adherence.

2. **Supplier & Contractor Management:** Drawing on the relational view advocated by Briscoe & Dainty (2005) and the problems of coordination

highlighted by Doloi et al. (2012), this dimension captures the quality of stakeholder relationships. The framework hypothesizes that transactional, poorly evaluated supplier relationships increase vulnerability to disruptions, whereas integrated management enhances reliability and problem-solving capacity.

3. **Logistics & Material Flow Management:** This dimension operationalizes the challenges identified by Vrijhoef & Koskela (2000) and Sullivan (2017). In a landlocked country like Ethiopia with complex logistics corridors, the efficiency of material movement—from global shipping to final site delivery—is theorized to have a direct, quantifiable impact on workflow continuity and, consequently, on time and cost performance.

4. **Information & Communication Integration:** Informed by the work of London (2009) and Fernie & Thorpe (2007), this dimension addresses the "glue" that binds the supply chain. The framework proposes that fragmented, slow, or inaccurate information flow (as opposed to integrated, digital systems) is a key moderator that can amplify the negative effects of disruptions in other dimensions, leading to rework and misalignment.

5. **Risk Management & Resilience:** Incorporating recent insights from Hosseini et al. (2022), this dimension moves beyond traditional risk registers. It assesses the proactive versus reactive nature of SCM strategy. The framework posits that a lack of structured resilience planning (e.g., multi-sourcing, contingency buffers) leaves projects exponentially more vulnerable to the external shocks prevalent in developing economies.

2.6.2 Project Performance as the Dependent Variable

The framework assesses performance through the classical project management "Iron Triangle" of time, cost, and quality. This tripartite outcome is chosen because it represents the most universally acknowledged and empirically measured indicators of project success. Literature consistently links SCM failures to deficits in these areas (Meng, 2012; Eriksson, 2010). The framework allows for the investigation of how different SCM weaknesses may disproportionately affect one performance indicator over others.

2.6.3 The Role of External Moderating Factors

A distinctive feature of this framework is the explicit inclusion of external moderating factors: **foreign currency availability, customs processes, global supply disruptions, and the regulatory environment**. This is a direct synthesis of the empirical evidence on developing countries' challenges (Ofori, 2012; Laryea & Hughes, 2011). The framework does not treat these as mere background context but as active variables that **moderate the relationship** between SCM practices and project outcomes. For instance, even robust procurement planning may fail if a foreign currency shortage indefinitely delays Letter of Credit issuance. These factors explain why SCM best practices, derived often from stable contexts, may not yield equivalent results in Ethiopia without adaptation.

2.6.4 How the Framework Guides This Research

This conceptual framework serves as the analytical blueprint for the entire study. It:

- **Defines the Scope of Investigation:** It dictates that data collection (Chapter 3) must gather detailed information on each of the five SCM dimensions, the three performance indicators, and the manifested impact of the external factors.
- **Structures the Analysis:** It provides the thematic categories for organizing and analyzing the case study data in Chapter 4 (e.g., analyzing procurement timelines, assessing logistics bottlenecks).
- **Informs the Discussion:** It creates the structure for Chapter 5, where findings for each dimension are discussed in relation to the literature that justified its inclusion.
- **Focuses the Conclusions:** It ensures that the conclusions and recommendations in Chapter 6 address the specific levers (the five dimensions) and constraints (the external factors) identified in the model.

In summary, this framework synthesizes established CSCM theory with the specific, acute challenges of developing economies. It positions the CBE Headquarters Project as an instrumental case through which these theorized relationships can be examined empirically, thereby aiming to explain *how* and *why* SCM practices translated into the observed project performance outcomes within the unique Ethiopian milieu.

2.7 Identified Research Gap and Justification for This Study

Building upon the in-depth analysis and synthesis above, specific and consequential research gaps become evident:

2.7.1 Context-Specific Depth vs. General Theory: While the empirical link between SCM and performance is established in general literature, there is a scarcity of deep, holistic case studies examining how all five SCM dimensions interact simultaneously within the unique, constraint-heavy environment of an Ethiopian megaproject. Most studies focus on one or two dimensions in isolation.

2.7.2 Extreme Condition Analysis: There is limited empirical documentation of how acute, concurrent external shocks (like a global pandemic) intersect with chronic domestic systemic constraints (like persistent forex shortages) to cripple a project's supply chain. The CBE project offers a rare case to study this "perfect storm" scenario.

2.7.3 Practitioner-Based Validation in Ethiopia: Much of the cited evidence comes from other regions. A significant gap exists in locally-grounded, practitioner-informed research that validates global SCM theories within Ethiopia’s specific regulatory, financial, and logistical reality, and which can generate actionable, context-sensitive recommendations.

This study is justified as it directly addresses these gaps. By applying the synthesized conceptual framework (Fig 2.1) to an instrumental, extreme case (the CBE Headquarters), it aims to provide a nuanced, evidence-based explanation of SCM failure modes in Ethiopia. This will enrich the regional CSCM literature and translate global best practices into actionable insights for Ethiopian industry stakeholders.

Chapter 3: Research Methodology

3.1 Introduction

This chapter presents the methodological approach adopted to examine supply chain management (SCM) practices in the construction sector and their impacts on project performance, using the Commercial Bank of Ethiopia (CBE) Headquarters Project as the primary case study. A sound and rigorous methodological framework is essential to ensure the reliability, validity, and credibility of the research findings. Accordingly, this chapter outlines the research design, population and sampling techniques, data collection methods and instruments, data analysis procedures, and addresses ethical considerations and methodological limitations.

3.2 Research Design and Approach

This study adopts a mixed-methods sequential explanatory design nested within an instrumental single-case study framework. This integrated design is selected to comprehensively address the research questions, which demand both breadth of measurement and depth of understanding.

3.2.1 Justification for Mixed-Methods Sequential Explanatory Design

A mixed-methods sequential explanatory design combines quantitative and qualitative data collection and analysis in two consecutive phases: quantitative followed by qualitative (Creswell & Plano Clark, 2017). This approach is justified for several reasons pertinent to this research. First, the study aims not only to *measure* the prevalence and perceived importance of various SCM practices and challenges (quantitative goal) but also to *explain* the underlying causes, processes, and contextual dynamics behind these measures—such as *how* foreign currency shortages specifically disrupted procurement or *why* communication breakdowns occurred (qualitative goal). Quantitative data from surveys provide generalizable patterns and allow for statistical analysis of relationships between variables. Qualitative data from interviews and documents provide rich, contextual insights, capture stakeholder experiences, and uncover unforeseen issues. Second, this approach enables triangulation, where findings from one method can be validated, complemented, or clarified by the other, thereby enhancing the overall validity and robustness of the conclusions (Jick, 1979). For instance, survey results indicating severe logistics delays can be substantiated and elaborated upon through specific narratives from project managers in interviews.

3.2.2 Justification for Case Study Approach

The research is situated within an instrumental single-case study design (Yin, 2018). A case study is an empirical inquiry that investigates a contemporary phenomenon (the case) within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The Commercial Bank of Ethiopia (CBE) Headquarters Project is the instrumental case—it is examined not for its intrinsic uniqueness alone, but because it serves as a strategic, information-rich context through which the broader phenomenon of SCM in Ethiopian megaprojects can be understood. This approach is appropriate for three primary reasons. First, the research questions are primarily "how" and "why" questions, which are well-suited to case study investigation. Second, the phenomenon of SCM in this context is complex and embedded within a unique socio-economic and regulatory environment (Ethiopia's forex constraints, import dependency), requiring an in-depth, holistic analysis that preserves the interconnectedness of factors. Third, the researcher has limited control over behavioral events, as the project is a past event, making a case study relying on retrospective data, documents, and accounts the most feasible and powerful strategy. The single-case design is justified as the CBE project is a critical, revelatory, and extreme case (Yin, 2018). It is *critical* because its significant delays directly manifest the consequences of SCM weaknesses; *revelatory* because such in-depth analysis of a landmark Ethiopian megaproject's supply chain is scarce; and *extreme* in its scale and import dependency, allowing for the observation of phenomena in a heightened form. The combination of these two designs means that within the bounded system of the CBE project case, both numeric trends (from surveys of involved personnel) and detailed explanations (from interviews and documents) are gathered and integrated to construct a comprehensive and nuanced analysis.

3.3 Population, Sampling, and Participants

3.3.1 Target Population

The target population for this study comprises professionals who were directly involved in the CBE Headquarters Project or possess extensive experience in similar large-scale construction activities in Ethiopia. This specifically includes project managers, procurement and contract officers, logistics personnel, site engineers, representatives from key suppliers and subcontractors, as well as consultants and supervisors associated with such projects.

3.3.2 Sampling Technique

A combination of purposive and stratified sampling strategies was employed to ensure both depth and breadth in data collection. A purposive sampling technique was used for the qualitative interview component. This strategy allowed for the deliberate selection of information-rich participants who possessed deep, firsthand knowledge of the SCM practices, decision-making processes, and challenges specific to the CBE project, as recommended by Patton (2002). For the quantitative survey component, a stratified sampling approach was implemented. The sampling frame was stratified according to the main functional groups involved in construction SCM: procurement, engineering/construction, logistics, and project management. This ensured that the survey respondents represented a balanced cross-section of professional perspectives relevant to the research questions.

3.3.3 Sample Size

The final sample for the study consisted of 54 complete and valid survey responses, which is deemed adequate for conducting descriptive and basic inferential statistical analyses within a case study context. Additionally, in-depth, semi-structured interviews were conducted with 10 key informants. This number aligns with recommendations for qualitative research where the goal is depth and thematic saturation rather than statistical generalizability, and it is sufficient to achieve comprehensive insights from diverse stakeholder roles (Guest et al., 2006). This sample was further enriched by the comprehensive analysis of primary project documentation, including schedules, procurement logs, material lists, and progress reports.

3.4 Data Collection Methods

Data were collected from both primary and secondary sources to enable methodological triangulation.

3.4.1 Primary Data Collection

Primary data were gathered through two main instruments. First, a structured questionnaire survey was administered to collect quantitative data on participants' perceptions of SCM practices, the significance of various challenges, and their assessment of project performance indicators (time, cost, quality). The survey utilized Likert scales to quantify these perceptions. Second, semi-structured interviews were conducted with selected key informants. These interviews were designed to elicit detailed, narrative insights into SCM processes, the root causes of delays and disruptions, evaluations of supplier and logistics performance, and the perceived effects on project outcomes. With prior consent, all interviews were audio-recorded and later transcribed verbatim to ensure accuracy for thematic analysis.

3.4.2 Secondary (Original) Data Collection

A substantial body of secondary, original data was drawn from the CBE Headquarters Project archives. This evidence-based documentation included internal project schedules, procurement orders and logs, import and customs documentation, material delivery records, progress reports, and relevant correspondence. This original data served a critical triangulation function, providing an objective benchmark against which to compare and validate the perceptions gathered through surveys and interviews.

3.5 Data Collection Instruments

3.5.1 Questionnaire

The survey questionnaire was structured into four main sections. Section A collected demographic and professional background information. Section B assessed the level of agreement with statements regarding SCM practices, using items adapted from established instruments in the literature (e.g., Flynn et al., 2010; Dainty et al., 2001).

Section C evaluated the perceived significance of various SCM challenges. Finally, Section D solicited respondents' assessments of the project's time, cost, and quality performance. The instrument was pilot-tested with three professionals to ensure clarity, relevance, and reliability before full deployment.

3.5.2 Semi-Structured Interview Guide

The interview guide was developed to ensure coverage of all key themes derived from the conceptual framework while allowing flexibility for probing and exploration. It contained open-ended questions organized around several core areas: procurement strategy and planning, supplier selection and relationship management, logistics and material flow challenges, the quality of information sharing and communication, approaches to risk management, and the interviewee's assessment of how SCM factors ultimately impacted project outcomes.

3.6 Data Analysis Methods

The analysis followed the sequential logic of the mixed-methods design, with quantitative analysis informing subsequent qualitative exploration.

3.6.1 Quantitative Data Analysis

Quantitative data collected from the questionnaire surveys were analyzed using a combination of descriptive and inferential statistical methods, processed primarily with IBM SPSS Statistics (Version 28) and supplemented with Microsoft Excel for initial data organization. The application and purpose of each method are detailed below.

1. Descriptive Statistics

Purpose: To summarize, describe, and present the basic features of the survey data, providing a clear profile of respondents' perceptions regarding SCM practices, challenges, and project performance.

Application: For all scaled items in Sections B, C, and D of the questionnaire (see Appendix A), the following were calculated:

- **Frequency Distributions and Percentages:** To show the count and proportion of respondents choosing each point on the Likert scale (e.g., the percentage of respondents who "Strongly Agreed" that procurement planning was proactive).

- **Means (M) and Standard Deviations (SD):** The mean score provided a central tendency measure for each construct (e.g., the overall rating for "Procurement Planning"), while the standard deviation indicated the degree of consensus or dispersion among respondents. A low SD suggests high agreement, whereas a high SD indicates divergent views.

  These results are presented in summary tables (e.g., Table 4.1) and are used to answer Research Questions 1 and 2 by identifying the perceived strength of SCM practices and the significance of various challenges.

2. Correlation Analysis (Pearson's r)

Purpose: To examine the strength and direction of linear relationships between key variables, specifically testing the hypothesized links between SCM dimensions and project performance indicators as outlined in the conceptual framework (Figure 2.1).

Application: Composite scores were first created for each major construct by averaging the relevant item scores (e.g., a composite "SCM Effectiveness" score from Section B items, and separate composite scores for "Time Performance," "Cost Performance," and "Quality Performance" from Section D). Pearson's correlation coefficient (r) was then calculated to assess:

- The relationship between each of the five SCM practice areas (procurement, supplier management, logistics, information flow, risk management) and each of the three performance outcomes.

- The relationship between the perceived significance of specific challenge clusters (e.g., financial/logistical challenges) and the reported performance outcomes.

  Interpretation: Correlation coefficients (r) ranging from -1 to +1 were interpreted. A positive and statistically significant correlation ($p < 0.05$) would indicate that better-rated SCM practices are associated with better-rated project performance, providing quantitative support for the framework's propositions.

3. Cross-Tabulation (Chi-Square Test of Independence)

Purpose: To explore whether responses to key categorical variables (e.g., perceived level of a challenge) differed significantly across subgroups of the sample, such as professional role (Project Manager vs. Procurement Officer) or level of project involvement.

Application: Selected survey items were recoded into categorical groups (e.g., "High Challenge" vs. "Low/Moderate Challenge"). Cross-tabulation tables were generated to compare the response distributions between different functional groups. The Chi-Square (χ^2) test was subsequently applied to determine if any observed differences were statistically significant ($p < 0.05$).

Interpretation: A significant Chi-Square result would suggest that perceptions of SCM issues are not uniform but are influenced by the respondent's role or vantage point within the project. This adds depth to the analysis by highlighting which stakeholder groups experience certain challenges most acutely.

This multi-method analytical approach ensures that the quantitative data is not only described but also interrogated to uncover patterns, relationships, and group differences, thereby providing a robust empirical foundation for the study's findings.

3.6.2 Qualitative Data Analysis

Qualitative data from interview transcripts and secondary documents were analyzed using **thematic analysis** following the six-phase iterative process outlined by Braun and Clarke (2006). The process involved (1) repeated familiarization with the data through transcription and reading; (2) generating initial codes to capture interesting features; (3) searching for broader themes by collating relevant codes; (4) reviewing and refining themes to ensure they formed a coherent pattern and accurately reflected the dataset; (5) defining and naming each theme to capture its essence; and (6) producing the final analytical narrative, illustrated with vivid verbatim extracts from the interviews. This systematic approach enabled the identification of recurring patterns, contradictions, and deep insights regarding the operational realities of SCM in the project.

3.6.3 Triangulation

To enhance the credibility and validity of the findings, data triangulation was rigorously applied throughout the analysis phase. This involved systematically comparing and contrasting the patterns emerging from the quantitative survey data with the rich, explanatory insights from the qualitative interviews. Furthermore, claims and recollections from both surveys and interviews were cross-verified against the factual, time-stamped evidence contained in the original project documentation (e.g., delivery logs confirming reported delays). This convergence of evidence from multiple independent sources strengthened the robustness and persuasiveness of the final conclusions.

3.7 Validity and Reliability

Multiple strategies were employed to ensure the validity and reliability of the study, addressing both quantitative and qualitative research concerns.

3.7.1 Validity

Construct validity was established by operationalizing key constructs (SCM practices, challenges, performance) using measurement scales adapted from validated instruments in prior literature. The survey and interview guides were reviewed by academic experts and piloted to ensure they accurately captured the intended concepts. Internal validity was strengthened through methodological triangulation (as described in 3.6.3) and pattern matching, where observed case events were compared against predictions from the conceptual framework. External validity, or generalizability, in a single-case study is analytical rather than statistical; the study aims to generalize findings to theory (i.e., SCM in constrained environments) rather than to a population. Rich, thick description of the case context is provided to allow readers to assess the transferability of conclusions to similar settings. Content validity was ensured by grounding the research design and instruments in a comprehensive literature review and a multidimensional conceptual framework.

3.7.2 Reliability

Instrument reliability for the survey was supported by its structured format and the use of established Likert-scale items. The internal consistency of multi-item scales was assessed post-hoc using Cronbach's Alpha, with coefficients above 0.7

considered acceptable. Procedural reliability was maintained through a detailed research protocol that documented all steps from sampling to analysis. Interviewer consistency was ensured by using a semi-structured guide. For qualitative analysis, an initial coding framework was developed, and inter-coder reliability was checked on a subset of transcripts to refine the framework, enhancing the dependability of the thematic analysis. All primary data, transcripts, and secondary documents were systematically organized into a case study database to create a clear audit trail, as recommended by Yin (2018).

3.8 Ethical Considerations

This research adhered to stringent ethical standards throughout its execution. Prior to participation, all interviewees and survey respondents were provided with a clear information sheet detailing the study's purpose, the voluntary nature of their participation, and the measures in place to protect their anonymity and confidentiality. Written informed consent was obtained from all interview participants. Data collected were stored securely on password-protected devices, and any identifying information was anonymized in the final thesis and reports. The research protocol was conducted in accordance with the ethical guidelines of Mekelle University.

3.9 Limitations of the Methodology

While rigorous, this methodological approach has certain inherent limitations. First, access to some confidential financial documents was restricted, which may limit the granularity of the cost performance analysis. Second, the reliance on retrospective interviews and surveys introduces the possibility of recall bias among participants. Third, the use of a single, albeit extreme, case study design limits the statistical generalizability of the findings; the results are most relevant for understanding similar megaprojects in comparable socio-economic contexts. Finally, while triangulation mitigates this risk, attributing causality solely to SCM factors remains complex due to the potential confounding influence of external macroeconomic and global events (e.g., the COVID-19 pandemic). These limitations are acknowledged, and conclusions are drawn with appropriate caution.

Chapter 4: Data Presentation and Analysis

4.1 Introduction

This chapter presents the data obtained from project documentation, questionnaire responses, and interviews with key stakeholders involved in the construction of the Commercial Bank of Ethiopia (CBE) Headquarters Project. The purpose is to assess supply chain management (SCM) practices and analyze their implications for project performance—particularly schedule, cost, and quality outcomes. The chapter is structured into four main sections: an overview of the CBE Project and its supply chain characteristics; an analysis of procurement and supplier management practices; an examination of logistics, information flow, and risk management; and an overall assessment of SCM impact on project performance.

4.2 Overview of the CBE Headquarters Project

4.2.1 Project Description

The CBE Headquarters is a 209.3-meter, 53-floor high-rise landmark building located in Addis Ababa. It includes a main tower, two podium buildings, extensive mechanical, electrical, and plumbing (MEP) systems, and underground parking facilities. According to internal records, construction commenced in July 2015 with an original completion target of 19 January 2019. The project was ultimately completed on 13 February 2022, indicating a total delay of more than three years. (Ori ginal CBE Project Data, 2022).

4.2.2 Key Supply-Chain Characteristics

The project required the procurement of specialized materials and equipment, such as custom-designed curtain wall units (5,208 pieces), imported elevators and escalators, firefighting systems, HVAC and specialized MEP components, electrical switchgear and transformers, and finishing materials such as stone, aluminum panels, glass, and marble. Due to Ethiopia's limited manufacturing capacity for these items, over 70% of high-value materials were imported, resulting in heavy dependence on foreign suppliers and global logistics networks.

4.2.3 Major Causes of Delay

A triangulated analysis of project documentation, procurement logs, and stakeholder interviews reveals that the project's three-year delay was not attributable to a single factor, but rather to a cascade of interconnected supply chain failures, each exacerbated by the Ethiopian context and global events. The primary causes are elaborated below.

The first major cause was foreign currency shortages and Letter of Credit (LC) issuance delays. Ethiopia's chronic foreign exchange (FX) scarcity constituted a fundamental, systemic constraint. The project's heavy reliance on imported, high-value materials required timely opening of LCs to secure manufacturing slots and initiate shipments. However, securing FX allocation from the national banking system was unpredictable and often protracted, leading to LC issuance delays of four to six months for critical items. This delay shifted the entire procurement timeline downstream, creating an irrecoverable bottleneck at the project's outset.

The second cause was overseas manufacturing and lead time volatility. The procurement of custom-engineered components, particularly the 5,208 unique curtain wall units, involved complex fabrication with long lead times. While some delay was inherent, it was compounded by reactive ordering due to the aforementioned LC delays, which pushed fabrication start dates later than optimal, and by capacity constraints at overseas fabricators, especially during peak global construction periods. This resulted in manufacturing delays extending beyond the original quoted lead times by an average of 2–3 months per major batch.

The third cause was global logistics and port congestion. The international shipping leg faced severe disruptions, particularly from 2020 onward due to the COVID-19 pandemic. This manifested as vessel schedule unreliability and skyrocketing freight costs, severe congestion at transshipment ports like Djibouti, where materials could wait for weeks to berth, and global container shortages. These factors added an unpredictable 1–2 month buffer to sea freight durations, disconnecting shipment dates from on-site construction sequences.

The fourth cause was protracted customs and inland clearance procedures. Upon arrival at the Port of Djibouti, materials entered a complex clearance regime. Delays stemmed from manual and multi-agency inspection processes, incomplete or inconsistent documentation from suppliers, leading to queries and rejections, and limited coordination between clearing agents, project logistics teams, and authorities. Customs clearance alone often added 3–6 weeks of dwell time before materials were released for inland transport.

The fifth cause was fragmented coordination among suppliers and subcontractors. The project's supply chain involved a multi-tier network of international and local entities. Poor coordination was evident in misaligned schedules between foundation/structural work and the delivery of façade support systems, lack of integrated planning between MEP installers and finishing material suppliers, leading to workspace conflicts, and inadequate information sharing regarding on-site progress and readiness for deliveries. This fragmentation caused sequential work stoppages and rework, eroding productivity.

The sixth cause was design revisions and procurement misalignment. Although BIM was used, late-stage design revisions—often driven by client requests or value engineering—occurred after procurement orders for long-lead items had been placed. This created a critical mismatch: suppliers were manufacturing to outdated specifications, necessitating costly and time-consuming change orders, fabrication halts, or in some cases, acceptance of non-conforming materials to avoid further delay.

Crucially, these causes did not operate in isolation. For instance, an FX/LC delay would push back a manufacturing order, which would then encounter pandemic-driven shipping delays, only to be held up in customs, finally arriving on-site to find that preceding trades were behind schedule due to poor coordination. This domino effect fundamentally undermined the project schedule, transforming isolated supply chain issues into a systemic project delay.

4.3 Survey Respondent Profile and Results Summary

4.3.1 Demographic Characteristics of Respondents

Prior to presenting the substantive findings, it is essential to describe the profile of the survey respondents to contextualize their perspectives. A total of 54 valid responses were received from professionals involved in or familiar with large-scale construction projects in Ethiopia, with a specific focus on the CBE Headquarters Project. Table 4.1 summarizes their key demographic and professional characteristics.

Table 4.1: Demographic and Professional Profile of Survey Respondents (N=54)

Characteristic	Category	Frequency	Percentage
Current Position	Project Manager	10	18.5%
	Site Engineer	12	22.2%
	Procurement Officer	9	16.7%
	Logistics/Store Manager	8	14.8%
	Consultant	6	11.1%
	Contractor/Subcontractor	7	13.0%
	Other (Project Planner, QA/QC)	2	3.7%
Years in Construction Industry	Less than 2 years	2	3.7%
	2 – 5 years	10	18.5%

Characteristic	Category	Frequency	Percentage
	6 – 10 years	22	40.7%
	More than 10 years	20	37.0%
Specific SCM/Procurement Experience	Less than 2 years	4	7.4%
	2 – 5 years	16	29.6%
	6 – 10 years	20	37.0%
	More than 10 years	14	25.9%
Involvement in CBE Project	Direct involvement	22	40.7%
	Indirect involvement	18	33.3%
	Not involved (but similar experience)	14	25.9%

As illustrated in Table 4.1, the respondent pool represents a diverse and experienced cross-section of construction professionals. **Over three-quarters (77.7%) of respondents reported having more than 5 years of experience in the construction industry**, with 37.0% possessing over a decade of experience. This ensures that the survey responses are grounded in substantial practical knowledge. Furthermore, **the distribution across key functional roles**—project management (18.5%), site engineering (22.2%), procurement (16.7%), and logistics (14.8%)—ensures that the data captures multifaceted perspectives on SCM practices from its core implementing units. Notably, **a combined 74.0% of respondents had either direct (40.7%) or indirect (33.3%) involvement with the CBE Headquarters Project**, lending particular credibility and relevance to their assessments of its specific supply chain challenges and performance outcomes. The remaining 25.9%, while not directly involved, possessed comparable experience in similar large-scale Ethiopian construction projects, providing a valuable external benchmark.

4.3.2 Summary of SCM Practices, Challenges, and Performance Ratings

Quantitative data from the survey provide a measurable overview of SCM practices, challenges, and perceived project performance. Respondents rated each item on a 5-point Likert scale, with results summarized in Table 4.2.

Table 4.2: Survey Results Summary: SCM Practices, Challenges, and Performance Ratings

(Scale: 1 = Strongly Disagree/Not Significant, 5 = Strongly Agree/Highly Significant)

Construct & Items	**Mean**	**SD**	**Interpretation**
B. SCM Practices (Agreement)			
B.1 Procurement Planning	2.8	0.9	Weak
B.2 Supplier & Contractor Management	3.0	0.8	Moderate
B.3 Logistics & Material Flow Management	2.6	1.0	Weak
B.4 Information Flow & Communication	2.9	0.9	Moderate
B.5 Risk Management & Resilience	2.7	1.0	Weak

Construct & Items	Mean	SD	Interpretation
C. SCM Challenges (Significance)			
C.1 Financial & Regulatory (FX, LC, Customs)	4.5	0.7	Highly Significant
C.2 Logistics & Infrastructure (Shipping, Port, Transport)	4.0	0.8	Significant
C.3 Supplier & Market (Reliability, Lead Times, Price Volatility)	3.8	0.9	Significant
C.4 Project & Coordination (Planning, Information, Contracts)	3.6	0.9	Moderately Significant
D. Project Performance (Agreement)			
D.1 Time Performance (Schedule Adherence)	2.5	1.1	Weak
D.2 Cost Performance (Budget Control)	2.7	1.0	Weak
D.3 Quality Performance (Conformance to Standards)	3.8	0.8	Moderate to Strong

*Note: N = 54 survey respondents. SD = Standard Deviation. *

*Interpretation based on mean scores: 1.0–2.4 = Weak, 2.5–3.4 = Moderate, 3.5–5.0 = Strong. *

4.4 Procurement and Supplier Management Analysis

4.4.1 Procurement Planning

Survey responses indicate mixed levels of satisfaction with procurement planning. Only 38% of respondents agreed that procurement planning was conducted early and systematically, while 62% reported issues related to late material forecasting and misalignment with construction schedules. Interview participants repeatedly emphasized that planning for long-lead imported materials was reactive, not proactive. One procurement officer stated: "Long-lead items like the curtain wall and HVAC equipment were identified too late. The LC delays made it worse." This confirms that procurement planning was a central bottleneck.

4.4.2 Supplier Selection and Evaluation

Although major suppliers were technically qualified, documentation shows that selection was heavily influenced by price competitiveness, availability of foreign currency, and supplier willingness to accept phased or delayed payments. However, the evaluation of supplier capacity, delivery reliability, and logistics capability was limited. Survey findings show that 55% disagreed that supplier performance was monitored effectively, and 47% believed that subcontractor coordination significantly contributed to project delays. Interview insights further highlight challenges: "Some suppliers were reliable, but the absence of a regular evaluation mechanism made it difficult to track performance."

4.4.3 Procurement Timeline for Imported Materials

A Gantt-style procurement timeline (Figure 4.1) indicates that major imported materials experienced average delays of **3–8 months** beyond planned delivery dates, as detailed in **Table 4.6**.

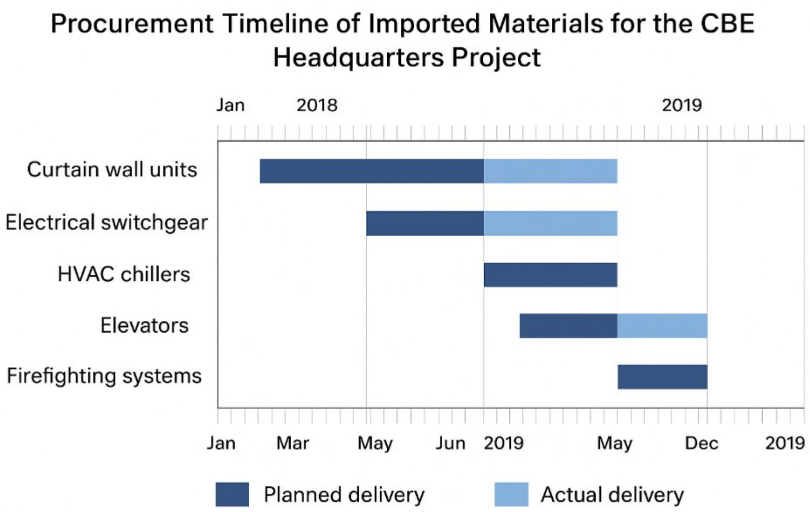
Table 4.6: Procurement Delays for Key Imported Materials

Material Category	Planned Delivery	Actual Delivery	Delay (Months)
Curtain wall units	Sept 2018	May 2019	8

Material Category	Planned Delivery	Actual Delivery	Delay (Months)
Electrical switchgear	Jan 2019	July 2019	6
HVAC chillers	Nov 2018	Apr 2019	5
Elevators & escalators	Feb 2019	Oct 2019	8

Source: Original CBE Project Data

Figure 4.1: Procurement Timeline of Imported Materials for the CBE Headquarters Project



Key contributing factors included LC issuance delays, supplier-side manufacturing backlogs, port congestion and shipping constraints, and customs inspection delays. These delays directly impacted structural finishing, MEP installation, and commissioning phases.

4.5 Logistics and Material Flow Analysis

4.5.1 Import Logistics and Transportation

Logistics performance was one of the major weaknesses identified. Survey results, as summarized in Table 4.3, reveal significant logistics challenges: 68% of respondents rated import logistics coordination as inadequate, 72% identified customs clearance delays as a major bottleneck, and 63% cited port congestion as a recurring issue.

Table 4.3: Survey Responses on Logistics Challenges

Challenge Category	Percentage of Respondents Reporting Issue
Import logistics coordination inadequate	68%
Delays due to customs clearance	72%
Port congestion as a recurring issue	63%

Source: Survey of 54 project stakeholders (2025)

Interview insights highlight significant procedural delays:
"Even after materials arrived at Djibouti port, customs clearance and inland transport would take weeks or sometimes months."

4.5.2 Local Transport and Site Delivery

Respondents indicated additional inefficiencies, including irregular delivery schedules, congestion around the central business district where the project is located, limited capacity for storage on site, and damage to materials due to improper handling. These challenges disrupted daily construction workflows, particularly during the façade installation and MEP phases.

4.6 Information Flow, Documentation, and Coordination

4.6.1 Communication Quality

Survey data on communication and information flow, presented in Table 4.4, indicates that 57% of respondents reported communication delays among project stakeholders, 49% believed that information flow was not well integrated across teams, and 44% noted delayed responses to design changes or procurement queries.

Table 4.4: Survey Responses on Communication and Information Flow Challenges

Challenge Category	Percentage of Respondents Reporting Issue
Communication delays among stakeholders	57%
Information flow not well integrated	49%
Delayed responses to design changes or procurement queries	44%

Source: Survey of 54 project stakeholders (2025)

Interview comments emphasized the slow internal approval processes:
"A design revision sometimes took weeks to reach procurement, and by then suppliers had already manufactured based on old drawings."

4.6.2 Use of Information Technology

The project relied mostly on traditional communication methods (emails, spreadsheets), with limited use of supply chain tracking tools, real-time procurement dashboards, and BIM-based procurement integration. This limited transparency, slowed decision-making, and prevented early identification of supply chain risks.

4.7 Risk Management and External Challenges

4.7.1 Major Supply Chain Risks Identified

Survey respondents rated the significance of various supply chain risks, with results detailed in Table 4.5. The table shows the percentage of respondents who rated each risk as "Highly Significant" (5 on a 5-point scale), along with the full distribution of responses across all significance levels.

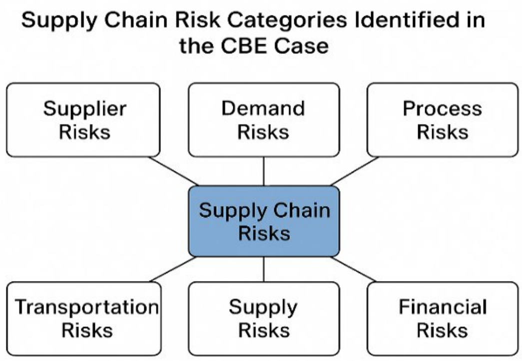
Table 4.5: Significance Ratings of Supply Chain Risks

Risk Factor	Not Significant 1	Slightly Significant 2	Moderately Significant 3	Significant 4	Highly Significant 5
Foreign currency shortage	2%	4%	8%	7%	**79%**
LC delays	3%	5%	10%	8%	**74%**
Global shipping disruptions	4%	6%	12%	10%	**68%**
Customs delays	5%	7%	13%	10%	**65%**
Supplier unreliability	8%	10%	15%	15%	**52%**

Source: Survey of 54 project stakeholders (2025)

Interpreted into the Figure 4.2 below, confirming the severity of external constraints affecting Ethiopian megaprojects.

Figure 4.2: Supply Chain Risk Categories Identified in the CBE Case



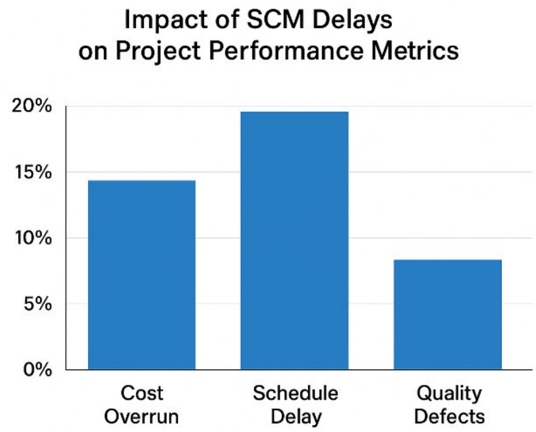
4.7.2 Mitigation Strategies Used

Project teams used several reactive strategies, including frequent follow-up with banks and suppliers, re-sequencing construction tasks, local substitutions for minor materials, and increased site storage of fast-moving items. However, preventive strategies such as multi-sourcing and risk-based procurement scheduling were largely absent. As one project manager stated: "We mostly reacted after delays happened—we did not have structured contingency plans."

4.8 Impact of SCM on Project Performance

The interrelationship between SCM delays and project performance metrics is summa rized in Figure 4.3.

Figure 4.3: Impact of SCM Delays on Project Performance Metrics



4.8.1 Time Performance

The project's three-year delay correlates strongly with supply chain issues. Curtain wall delays stalled façade installation and interior finishing, MEP equipment delays pushed back commissioning, shipping and customs delays caused frequent stoppages, and design-procurement misalignment triggered rework and idle time.

4.8.2 Cost Performance

While official financial records are confidential, interviewees indicated that cost overruns occurred due to extended time on site, additional costs for storage, rework, and expedited shipping, and price escalations during long procurement cycles. One respondent noted: "Every month of delay increased site overhead costs significantly."

4.8.3 Quality Performance

Quality was generally maintained but affected in several ways. Inadequate storage conditions led to occasional material damage, rework due to late design changes increased defect risk, and some materials substituted locally did not match the original specification (though minor). Overall, the project achieved acceptable quality but at the cost of time and budget increases.

4.9 Thematic Analysis of Interview Data

To complement the quantitative survey results, interview data from 10 key informants were analyzed using thematic analysis following the six-phase approach outlined by Braun and Clarke (2006). This process involved familiarization with transcripts, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing a structured report. Five core themes emerged, each corresponding to a key dimension of the conceptual framework and providing deeper insight into how SCM practices influenced project performance.

Theme 1: Reactive Procurement Planning Under Currency Constraints

Participants consistently described procurement planning as reactive rather than proactive, largely due to unpredictable foreign currency allocations. One procurement officer noted, "We couldn't place orders until the LC was approved, and that approval could take months—sometimes just when the supplier was ready to ship." This delay cascaded into later project phases, particularly affecting the customized curtain wall system, which required early fabrication commitments. The absence of contingency procurement schedules was frequently cited as a critical oversight.

Theme 2: Transactional Supplier Relationships Limiting Collaboration

Despite the technical competency of suppliers, relationships remained largely transactional. Several project managers highlighted that supplier selection prioritized cost and payment flexibility over reliability or logistical capability. A site engineer explained, "We had no regular performance reviews. If a supplier was late, we followed up—but there was no system to prevent it." This lack of strategic partnership reduced flexibility during disruptions and limited opportunities for early supplier involvement in design coordination.

Theme 3: Logistics as a Persistent Bottleneck

Logistics—particularly international shipping, customs clearance, and local transport—was identified as the most persistent operational bottleneck. Interviewees emphasized that delays at Djibouti port and complex clearance procedures consistently extended lead times. A logistics coordinator shared, "Even after the ship docked, materials could sit for weeks awaiting inspection and paperwork." These delays not only affected schedules but also increased costs through demurrage charges and expedited freight requests.

Theme 4: Fragmented Information Flow and Low Digital Adoption

Communication across stakeholders was described as fragmented, relying heavily on email and manual updates rather than integrated digital tools. Design changes were often communicated late, leading to rework or mismatched materials. One project manager observed, "We didn't have a real-time tracking system. You'd only know about a delay when the material didn't arrive on site." The limited use of BIM for procurement integration and the absence of a centralized project portal were noted as missed opportunities for transparency.

Theme 5: Reactive Risk Management in the Face of Systemic Uncertainties

Risk management was largely reactive, focusing on immediate problem-solving rather than proactive mitigation. While macro-risks such as forex shortages and global supply disruptions were acknowledged, formal contingency plans were scarce. A senior project lead reflected, "We managed risks as they came—reshuffling schedules, finding local alternatives. But we didn't have a risk register or predefined triggers." This ad-hoc approach reduced the project's resilience to concurrent disruptions such as COVID-19 and currency fluctuations.

Summary of Thematic Insights

These themes collectively illustrate how SCM weaknesses—particularly in planning, relationships, logistics, information, and risk preparedness—interacted to exacerbate delays and cost overruns. The qualitative findings deepen the quantitative results by revealing the contextual, procedural, and relational mechanisms behind the ratings presented in Table 4.1.

4.10 Summary of Key Findings

The analysis reveals the following major themes:

1. Procurement planning was weak, especially for long-lead imported materials.
2. Supplier and subcontractor management lacked systematic evaluation, contributing to delays.
3. Import logistics and customs clearance were major bottlenecks, causing extensive delays.
4. Information flow and communication were slow and uncoordinated, especially regarding design changes.
5. Risk management was mostly reactive, not proactive or strategic.
6. SCM deficiencies significantly impacted time, cost, and—indirectly—quality performance.
7. External factors (foreign currency, LCs, customs, global shipping) amplified supply chain vulnerability.

These findings form the basis for the discussion in Chapter 5.

Chapter 5: Discussion and Interpretation of Results

5.1 Introduction

This chapter discusses and interprets the results presented in Chapter 4 by comparing them with established theories and prior research in construction supply chain management (SCM). The purpose is to assess how the findings from the CBE Headquarters Project align with, extend, or differ from existing literature. The discussion is structured around the main components of SCM identified earlier: procurement planning, supplier management, logistics, information flow, risk management, and their implications for project performance.

5.2 Procurement Planning and Its Influence on Project Outcomes

5.2.1 Weak Procurement Planning Consistent with Global CSCM Challenges

The findings indicated that procurement planning for the CBE Headquarters Project was insufficiently early or systematic. Only 38% of survey respondents agreed that procurement planning was proactive, and interview data pointed to late identification of long-lead imported items. This aligns with global literature emphasizing that procurement planning is a major determinant of project performance in construction. Dainty et al. (2001) and Eriksson (2010) highlight that procurement activities can account for over 60% of project cost and are often the root cause of delays when not carefully integrated with project schedules. Similarly, Doloi et al. (2012) found that misalignment between procurement and construction sequencing is one of the strongest predictors of schedule overruns.

5.2.2 Import Dependency Intensifies Planning Requirements

The CBE project is characterized by high import dependency for critical materials such as curtain wall units, MEP equipment, and electrical systems. In such cases, procurement cannot rely on short lead times or local market substitutes. Yet, the results show that planning for these items was reactive, which is inconsistent with best practices recommended by Vrijhoef and Koskela (2000) and London (2009), who stress that import-dependent supply chains require long forecasting horizons and early supplier engagement.

5.2.3 Delays in Procurement Directly Affected Project Phases

Curtain wall units and elevators—both long-lead items—experienced delays of 6 to 8 months. These delays affected MEP installation, façade works, and commissioning. Literature confirms that delays in long-lead items create cascading bottlenecks, especially in high-rise construction where sequential interdependency is high (Meng, 2012). Thus, empirical findings strongly reinforce theoretical expectations: inadequate procurement planning significantly compromises project time performance.

5.3 Supplier and Subcontractor Management

5.3.1 Weak Monitoring and Supplier Evaluation

Survey results showed that 55% of respondents disagreed that supplier performance was adequately monitored. The lack of systematic evaluation aligns with Briscoe and Dainty (2005), who suggest that the construction sector often relies on transactional, short-term procurement relationships rather than strategic partnerships. In the case of the CBE project, supplier selection appears driven primarily by cost, availability of foreign currency, and payment flexibility. While these are important considerations, excessive weight on price undermines quality and reliability—consistent with concerns raised by Eriksson (2010) that low-bid tendering can weaken supply chain integration and increase risk exposure.

5.3.2 Subcontractor Coordination as a Critical Challenge

Nearly half of the respondents (47%) reported subcontractor coordination problems. This is consistent with global evidence that subcontractor-related delays remain one of the most persistent issues in construction (Doloi et al., 2012). The literature attributes this to fragmented supply chain relationships, poor integration of subcontractors in planning, and inadequate communication and unclear responsibilities. Interview participants echoed these findings, describing poor alignment between subcontractors' schedules and procurement timelines.

5.4 Logistics and Material Flow Management

5.4.1 Logistics Bottlenecks Reinforce Theoretical Perspectives

The analysis in Chapter 4 showed that 68% of respondents rated logistics coordination as inadequate, with particular emphasis on port congestion, customs clearance delays, inland transportation inefficiencies, and material handling issues on site. These findings are consistent with Vrijhoef and Koskela's (2000) assertion that logistics management is one of the weakest links in construction supply chains. Similarly, Sullivan (2017) notes that poor logistics can contribute to up to 10% productivity loss in large-scale projects.

5.4.2 Ethiopia’s Import-Based Construction Economy Amplifies Risks

In developing countries with limited domestic manufacturing, logistics challenges are more severe due to longer international supply routes, dependency on shipping schedules, and multi-agency clearance processes. This supports Ofori's (2012) argument that developing nations' construction industries face systemic supply chain rigidity that directly affects project delivery. In the CBE project, interview participants described clearance processes at Djibouti port and inland transport delays that extended material lead times from weeks to several months, consistent with research by Laryea and Hughes (2011) on African procurement constraints.

5.5 Information Flow and Coordination

5.5.1 Fragmented Information Flow Mirrors Global Construction Issues

Survey results showed that 57% of participants experienced delays in communication, and nearly half cited poor integration of information. This is strongly aligned with findings in the literature that construction is often characterized by fragmented communication and decentralized decision-making (Fernie & Thorpe, 2007). Furthermore, London (2009) notes that ineffective information flow is one of the primary causes of rework, misaligned procurement quantities, and delayed responses to design changes.

5.5.2 Limited Use of Digital Tools

The study found minimal use of digital supply chain tools such as real-time material tracking, integrated BIM procurement modules, and automated procurement dashboards. This matches Turk & Klinc (2007), who observed that construction projects adopt digital systems much more slowly than other industries. The absence of real-time visibility contributed to delays and limited the project team's ability to proactively address supply chain disruptions.

5.6 Risk Management and External Challenges

5.6.1 Findings Support Global Concerns About Supply Chain Vulnerability

Survey responses indicated that foreign currency shortages (79%), LC delays (74%), and global shipping disruptions (68%) were the most significant risks. Similar findings are documented in international literature emphasizing the fragility of modern supply chains, especially for import-dependent industries (Hosseini et al., 2022).

5.6.2 Reactive Versus Proactive Risk Management

The CBE project relied mainly on reactive measures such as constant follow-up with banks and suppliers, resequencing tasks, and local substitutions for small items. However, the literature strongly supports proactive SCM and resilience-building practices. The table below summarizes the alignment between best practices from literature and the CBE project’s approach:

Best Practice (Literature)	**CBE Project Approach**	**Alignment**
Multi-sourcing	Limited	✕
Contingency procurement plans	Minimal	✕
Early supplier involvement	Partial	△
Supply chain risk mapping	Absent	✕
Forecast-based procurement strategies	Weak	✕

Hosseini et al. (2022) argue that construction supply chains require resilience frameworks that consider global disruptions, but such frameworks were not fully present in this project.

5.7 Implications for Project Performance

5.7.1 Time Performance

The project's three-year delay can be directly linked to SCM failures. Meng (2012) identifies supply chain-related delays—such as late materials, poor coordination, and logistics bottlenecks—as the most influential predictors of overall schedule overruns. The CBE data strongly corroborate this.

5.7.2 Cost Performance

Although full financial details were not available, the study found substantial cost impacts through extended overhead costs due to prolonged construction duration, additional expenses for expedited shipping, rework caused by communication delays, and inflation in material prices during long procurement cycles. This supports findings by Eriksson (2010) that poor SCM processes increase contingency costs and escalate project budgets.

5.7.3 Quality Performance

Quality was largely achieved but at increased cost and time. Literature (Briscoe & Dainty, 2005) notes that delayed materials and rework indirectly strain quality assurance processes. This dynamic was visible in handling issues and rework items witnessed in the CBE project.

5.8 Comparison with Literature and New Contributions

5.8.1 Alignment with Existing Theories

The study's findings largely align with known CSCM theories: SCM weaknesses lead to time and cost overruns; import-dependent supply chains carry higher risk; poor communication undermines coordination and planning; logistics inefficiencies constrain site productivity; and reactive risk management is insufficient in complex projects.

5.8.2 Contributions to Regional and Sectoral Knowledge

This study adds new empirical insights to the Ethiopian context. First, foreign currency constraints are uniquely severe and unpredictable, impacting procurement more heavily than in most regions discussed in global literature. Second, supply chain delays exceeding six months are common in megaprojects reliant on imports—a phenomenon rarely documented outside developing economies. Third, a centralized, state-linked financial system adds additional procedural layers to international procurement, intensifying SCM risks. Fourth, limited digital adoption makes real-time supply chain visibility difficult, even in large and high-budget projects. These findings enrich the literature by highlighting supply chain realities in Sub-Saharan construction megaprojects.

5.9 Summary of Discussion

In summary, procurement planning weaknesses were a major contributor to delays, confirming global SCM research. Supplier and subcontractor management was inconsistent, aligning with literature on fragmented construction supply chains. Logistics and import challenges reflected known issues in resource-constrained economies. Information flow lacked integration, echoing global concerns regarding communication in construction. Risk management was predominantly reactive, contrary to resilience strategies recommended in modern SCM theories. Project performance was significantly affected, particularly in schedule and cost outcomes. The study provides new insights specific to Ethiopia, especially concerning foreign currency and import dependency.

Chapter 6: Conclusion and Recommendation

6.1 Introduction

This chapter presents the conclusions of the study titled "Analysis of Supply Chain Management Practices in the Construction Sector: Implications for Project Performance (The Case of CBE Headquarters Building)" The study analyzed the supply chain management (SCM) practices applied in the Commercial Bank of Ethiopia (CBE) Headquarters Project and assessed how these practices influenced project schedule, cost, and quality performance. The chapter also offers recommendations for improving SCM effectiveness in future construction projects in Ethiopia and similar developing country contexts. Recommendations are structured at three levels: industry-level, organizational-level, and project-level.

6.2 Conclusions of the Study

6.2.1 Supply Chain Management Practices Were Inadequate for a Large, Import-Dependent Project

The study concludes that SCM practices applied in the CBE Headquarters Project were insufficient to support the complex, high-value, and highly import-dependent nature of the project. Procurement planning was reactive, supplier monitoring was irregular, logistics management was weak, communication was fragmented, and risk management lacked structure. These weaknesses are particularly detrimental in megaprojects where long-lead imported items—such as curtain wall systems, elevators, electrical switchgear, and HVAC equipment—must be planned months or years in advance.

6.2.2 Procurement Planning Was the Most Significant Contributor to Delays

Weak procurement planning emerged as the single most critical issue. Major findings include that long-lead items were not identified early enough; procurement schedules were not aligned with design development and construction sequencing; LC (Letter of Credit) issuance delays disrupted supplier timelines; and changes in design were not communicated promptly, leading to rework and late procurement adjustments. These deficiencies directly triggered cascading delays across multiple project phases, ultimately contributing to the project's more than three-year schedule overrun.

6.2.3 Supplier and Subcontractor Management Was Fragmented and Lacked Strategic Coordination

Despite working with technically qualified suppliers, the project lacked consistent mechanisms for evaluating supplier performance, monitoring delivery schedules, coordinating subcontractors, and ensuring accountability. The study concludes that supplier management focused too heavily on price and availability of foreign currency, rather than reliability, delivery capability, and logistics strength. This transactional approach undermined supply chain integration.

6.2.4 Import Logistics and Customs Clearance Were Major Bottlenecks

The data reveal serious delays in overseas manufacturing; shipping and port handling; customs inspection and clearance at Djibouti and Ethiopian inland depots; local transportation to the project site; and on-site storage and handling. These logistics challenges caused delays ranging from **3 to 8 months** for key materials. Inadequate logistics planning represents a critical gap in the project's overall SCM strategy.

6.2.5 Communication and Information Flow Were Slow and Poorly Integrated

Information flow across stakeholders—contractor, client, consultants, suppliers, and subcontractors—was found to be fragmented, manual and spreadsheet-based, and slow, especially regarding design and specification changes. The limited use of digital procurement systems or integrated communication tools reduced transparency and hindered timely decision-making.

6.2.6 Risk Management Was Reactive and Not Based on Structured Frameworks

Instead of using a proactive, risk-based SCM model, project teams relied on constant follow-up, task resequencing, emergency procurement adjustments, and occasional local substitutions. Such reactive measures were insufficient to mitigate systemic supply chain risks, especially those related to foreign currency shortages, global logistics disruptions, and LC delays.

6.2.7 SCM Weaknesses Significantly Affected Project Schedule, Cost, and

Quality

The study concludes that SCM was the dominant contributor to schedule delays and a significant factor in cost escalation. While the project ultimately met quality expectations, the lack of SCM integration increased the risk of defects, rework, and material handling damage. Overall, the results affirm that effective supply chain management is a critical determinant of project performance in megaprojects in developing economies.

6.3 Recommendations

Recommendations are provided at three levels to ensure comprehensive improvement.

6.3.1 Industry-Level Recommendations (Ethiopian Construction Sector)

The first recommendation is to strengthen national procurement and LC processing systems. This includes streamlining LC approval procedures for construction materials, improving coordination among banks, the National Bank of Ethiopia, and large project clients, and introducing priority channels for megaproject procurement with clear lead-time commitments.

The second recommendation is to enhance customs and port logistics efficiency. This can be achieved by implementing digital clearance systems and pre-approval processes, reducing redundancy in inspection procedures at Djibouti port and Ethiopian inland depots, and establishing dedicated customs desks for large-scale construction imports.

The third recommendation is to promote domestic manufacturing of essential materials. Encouraging local production of aluminum curtain wall components, electrical panels and fittings, HVAC components, and standardized finishing materials would significantly reduce foreign currency dependency, shipping risks, and lead times.

The fourth recommendation is to establish industry-wide SCM training and certification programs. Collaborations between academic institutions and construction associations can help develop training in procurement planning, logistics and supply chain integration, digital supply chain technologies, and supplier evaluation methodologies.

6.3.2 Organizational-Level Recommendations (Clients, Contractors, Consultants)

Organizations should first implement integrated supply chain management systems by investing in digital procurement platforms, material tracking dashboards, BIM-integrated procurement modules, and centralized communication portals. These systems create transparency and reduce reaction-based decision-making.

Second, organizations must develop standardized procurement planning procedures. This includes adopting guidelines that mandate early identification of long-lead items, alignment of procurement schedules with design stages, regular updating of procurement plans, and formal approval workflows.

Third, it is essential to build long-term strategic supplier partnerships. Instead of transactional, price-driven procurement, contractors should pre-qualify suppliers based on performance, establish framework agreements, conduct supplier audits and capacity assessments, and engage suppliers early in design development.

Fourth, contractors should strengthen capacity in logistics planning by creating dedicated logistics teams capable of forecasting shipping and customs lead times, coordinating inland trucking and site deliveries, and ensuring safe site storage and inventory management.

6.3.3 Project-Level Recommendations (Future Megaprojects)

At the project level, the first recommendation is to develop a supply chain risk register at project inception. The risk register should include currency fluctuation risks, LC processing delays, manufacturing and shipping lead time variability, customs bottlenecks, and supplier reliability issues. Each risk must have mitigation measures and contingency triggers.

Second, conduct monthly supply chain coordination meetings. Regular meetings between the contractor and the client, consultants, key suppliers, and subcontractors ensure alignment and early identification of delays.

Third, adopt fast-track procurement scheduling. This involves parallel processing of procurement and design, early procurement of long-lead items (where feasible), and pre-ordering based on verified supplier drawings.

Fourth, improve change management procedures. To minimize disruption, design changes must follow strict approval timelines, procurement teams must receive real-time updates, and revised drawings must be digitally distributed to all stakeholders.

Fifth, increase use of local substitution where possible. Where quality standards allow, local materials should replace imported ones to shorten procurement cycles, reduce logistics risks, and decrease foreign currency dependency.

6.4 Recommendations for Future Research

Future research should first undertake a comparative analysis of SCM practices across multiple Ethiopian megaprojects. This would help identify recurring systemic challenges and best practices.

Second, research should examine the impact of digital SCM systems on construction performance, quantifying the benefits of digital tracking, BIM integration, and automated procurement.

Third, longitudinal studies on the effect of foreign currency policy on construction supply chains could provide evidence for policy makers seeking to support the industry.

Fourth, a study of supplier development programs for local manufacturers would be valuable, evaluating the potential for Ethiopia to localize critical construction materials.

6.5 Chapter Summary

Chapter 6 concludes that SCM practices significantly shaped the performance of the CBE Headquarters Project. Inadequate planning, weak supplier coordination, extensive import-related logistics challenges, slow information flow, and reactive risk management were identified as major concerns. The chapter offered practical recommendations at the industry, organizational, and project levels, aimed at improving SCM effectiveness and reducing schedule and cost risks in future projects. These insights contribute to both academic knowledge and practical improvement of construction supply chains in Ethiopia.

References

- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.

- Briscoe, G., & Dainty, A. (2005). Construction supply chain integration: An elusive goal? *Supply Chain Management: An International Journal, 10*(4), 319–326. https://doi.org/10.1108/13598540510612739

- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

- Dainty, A., Briscoe, G., & Millett, S. (2001). New perspectives on construction supply chain integration. *Supply Chain Management: An International Journal, 6*(4), 163-173. https://doi.org/10.1108/EUM0000000006034

- Doloi, H., Sawhney, A., Iyer, K. C., & Rentala, S. (2012). Analysing factors affecting delays in Indian construction projects. *International Journal of Project Management, 30*(4), 479–489. https://doi.org/10.1016/j.ijproman.2011.10.004

- Eriksson, P. E. (2010). Partnering: What is it, when should it be used, and how should it be implemented? *Construction Management and Economics, 28*(9), 905–917. https://doi.org/10.1080/01446193.2010.504165

- Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management, 28*(1), 58–71. https://doi.org/10.1016/j.jom.2009.06.001

- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59–82. https://doi.org/10.1177/1525822X05279903

- Hosseini, M. R., Martek, I., Zayed, T., & Banihashemi, S. (2022). Building supply chain resilience: Lessons from recent global disruptions. *Journal of Construction Engineering and Management, 148*(7), 04022071. https://doi.org/10.1061/(ASCE)CO.1943-7862.0002303
- Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24*(4), 602–611. https://doi.org/10.2307/2392366
- Koskela, L. (1992). *Application of the new production philosophy to construction* (Technical Report No. 72). Center for Integrated Facility Engineering, Stanford University.
- Laryea, S., & Hughes, W. (2011). Risk and price in the bidding process of contractors in Ghana. *Construction Management and Economics, 29*(10), 981–994. https://doi.org/10.1080/01446193.2011.588956
- London, K. (2009). *Construction supply chain economics*. Taylor & Francis.
- Meng, X. (2012). The relationship between project performance and supplier relationship management. *International Journal of Project Management, 30*(3), 297–302. https://doi.org/10.1016/j.ijproman.2011.10.001
- Ofori, G. (2012). *Developing the construction industry in Ghana: The case for a central agency*. Institute of Economic Affairs.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). SAGE Publications.
- Sullivan, J. (2017). Logistics performance in large construction projects: Causes, impacts, and strategies. *Journal of Construction Engineering and Management, 143*(12), 04017098. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001409

- Turk, Ž., & Klinc, R. (2007). Mobile computing and construction. *Automation in Construction, 16*(5), 632–640. https://doi.org/10.1016/j.autcon.2006.10.001

- Vrijhoef, R., & Koskela, L. (2000). The four roles of supply chain management in construction. *European Journal of Purchasing & Supply Management, 6*(3–4), 169–178. https://doi.org/10.1016/S0969-7012(00)00013-7

- Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American Journal of Sociology, 87*(3), 548–577. https://doi.org/10.1086/227496

- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

- Commercial Bank of Ethiopia (CBE) Headquarters Project. (2022). *Project Documentation, Schedules, and Procurement Records* [Unpublished raw data and internal reports]. Addis Ababa, Ethiopia.

APPENDICES

Appendix A: Questionnaire

Questionnaire for Assessing Supply Chain Management Practices in the Constru ction Sector in Ethiopia: Implications for Project Performance.

Section A: Respondent Background

Instruction: The following questions are about your professional background. Please select the **one option** that best describes your current situation by marking (✓) or circling your choice.

1. Current Position:
    - o Project Manager
    - o Site Engineer
    - o Procurement Officer
    - o Logistics/Store Manager
    - o Consultant
    - o Contractor/Subcontractor
    - o Other (Please specify): ___________
2. Years of experience in the construction industry:
    - o Less than 2 years
    - o 2 – 5 years
    - o 6 – 10 years
    - o More than 10 years
3. Years of specific experience in supply chain, procurement, or logistics:
    - o Less than 2 years

- 2 – 5 years
- 6 – 10 years
- More than 10 years

4. Level of involvement in the CBE Headquarters Project:
    - Direct involvement (e.g., worked on-site or directly with its supply chain)
    - Indirect involvement (e.g., provided services/materials, consulted)
    - Not involved (but experienced in similar projects)

Section B: SCM Practices (Likert 1–5)

Procurement Planning, Supplier Management, Logistics, Information Flow, Risk Management

Instruction: This section asks about your perception of various **Supply Chain Management (SCM) practices** in the context of large Ethiopian construction projects (like the CBE project). Please rate your agreement with each statement based on your experience.

- **Use the following scale:**
    - **1 = Strongly Disagree (SD)**
    - **2 = Disagree (D)**
    - **3 = Neutral (N)**
    - **4 = Agree (A)**
    - **5 = Strongly Agree (SA)**
- Please indicate your rating by writing the appropriate number (1 to 5) for each statement.

B.1 Procurement Planning

		SDA 1	DA 2	N 3	A 4	SA 5
A	Procurement plans were developed before the start of construction activities.					
b	Long-lead and critical materials were identified and prioritized in procurement schedules.					
c	Procurement timelines were realistically aligned with the overall project master schedule.					
d	There was a formal process for updating procurement plans in response to design changes.					
e	Budget allocation for materials was accurate and sufficient at the procurement planning stage.					

B.2 Supplier & Contractor Management

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	Supplier selection was based on a comprehensive evaluation of capability, past performance, and financial stability.					
b	Clear performance metrics (e.g., on-time delivery, quality) were established for key suppliers.					
c	Supplier performance was regularly monitored and reviewed					

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
	against agreed-upon metrics.					
d	Relationships with major suppliers were collaborative rather than purely transactional.					
e	Subcontractors were effectively integrated into project planning and coordination meetings.					

B.3 Logistics & Material Flow Management

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	There was a dedicated logistics plan for the importation of materials (from port to site).					
b	On-site material handling and storage were planned to minimize damage and loss.					
c	The sequence of material deliveries was well-coordinated with the construction sequence on					

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
	site.					
d	Alternative transport routes or modes were considered to mitigate potential logistics disruptions.					
e	Inventory levels of critical materials were monitored to prevent work stoppages.					

B.4 Information Flow & Communication

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	There was a centralized system (e.g., shared platform, regular meetings) for sharing procurement and logistics information among all stakeholders.					
b	Design changes and updates were communicated to the procurement and supplier teams promptly.					

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
c	The status of material orders and shipments was visible in real-time to the project management team.					
d	Digital tools (e.g., ERP, BIM, tracking software) were effectively used to manage supply chain information.					
e	Communication between the site team and the procurement/off-site team was clear and frequent.					

B.5 Risk Management & Resilience

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	Potential supply chain risks (e.g., currency fluctuation, shipping delays, supplier default) were formally identified and assessed early in the project.					

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
b	A formal risk mitigation or contingency plan existed for major supply chain risks.					
c	Alternative (backup) suppliers were identified for critical materials.					
d	The project maintained strategic buffer stock for materials with high supply risk.					
e	The supply chain strategy demonstrated adaptability in response to unforeseen disruptions (e.g., pandemic, policy changes).					

Section C: SCM Challenges (Likert 1–5)

FX shortages, LC delays, customs, shipping, supplier reliability, etc.

Instruction: This section lists potential **challenges** that can affect supply chains in Ethiopian construction. Please rate how **significant** you believe each challenge was/is in affecting project performance.

- **Use the following scale:**
  - **1 = Not Significant (NS)**

- 2 = Slightly Significant (SS)
- 3 = Moderately Significant (MS)
- 4 = Significant (S)
- 5 = Highly Significant (HS)

- Please indicate your rating by writing the appropriate number (1 to 5) for each challenge.

Assessment of Supply Chain Challenges

Respondents will be asked to rate the significance of the following specific challenges using a Likert scale (1=Not Significant to 5=Highly Significant):

C.1 Financial & Regulatory Challenges:

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
a	FX Shortages: Acute shortage of foreign currency for procuring imported materials and equipment.					
b	LC Delays: Excessive bureaucratic delays in obtaining and approving Letters of Credit from banks.					
c	Customs Delays: Protracted and unpredictable customs clearance procedures at ports of entry.					
d	Regulatory Changes: Unanticipated changes in government					

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
	import/export policies or tax regulations during the project.					

C.2 Logistics & Infrastructure Challenges:

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
a	Shipping Delays: There are frequent delays in international shipping schedules and vessel availability.					
b	Port Congestion: There is severe congestion at transshipment ports (e.g., Djibouti), causing long waiting times.					
c	Inland Transport: There is u nreliable, costly, and limited availability of inland transportation (trucking) from port to site.					
d	Poor Road Infrastructure: There are deteriorated road conditions leading to transport damage and extended delivery times.					

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
e	On-site Logistics: There are i nefficient material handling, storage, and distribution systems within the construction site.					

C.3 Supplier & Market Challenges:

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
a	Supplier Reliability: There is failure of key suppliers to deliver materials on time.					
b	Manufacturing Delays: There is e xtended lead times from overseas manufacturers for customized or specialized components.					
c	Limited Local Capacity: There is i nsufficient technical capability or production capacity of local suppliers for critical items.					
d	Price Volatility: There is significant and unforeseen fluctuations in the					

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
	price of key construction materials.					
e	After-Sales Support: There is lack of timely technical support or spare parts provision from equipment suppliers.					

C.4 Project & Coordination Challenges:

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
a	Poor Procurement Planning: There is inadequate forecasting of material requirements and late initiation of procurement processes.					
b	Design-Procurement Misalignment: There is lack of coordination between design finalization and procurement activities, leading to rework.					

No.	Challenge	NS 1	SS 2	MS 3	S 4	HS 5
c	Information Asymmetry: There is p oor information sharing and communication gaps between the project team, contractors, and suppliers.					
d	Contractual Disputes: There is d isagreements and conflicts with suppliers or subcontractors over terms, scope, or payments.					

Section D: Project Performance (Likert 1–5)

Time, cost, quality performance

Instruction: This section asks about your assessment of **project performance outcomes** (Time, Cost, Quality) as they relate to supply chain issues. Please indicate your level of agreement with each statement.

- **Use the following scale (same as Section B):**
    - **1 = Strongly Disagree (SDA)**
    - **2 = Disagree (DA)**
    - **3 = Neutral (N)**
    - **4 = Agree (A)**
    - **5 = Strongly Agree (SA)**
- Please indicate your rating by the appropriate number (1 to 5) for each statement.

D.1 Time Performance (Schedule Adherence)

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	The project was completed on or ahead of its originally planned completion date.					
b	Major project milestones (e.g., structural completion, façade installation) were achieved on schedule.					
c	Supply chain-related issues (e.g., material delays) were the primary cause of any schedule overruns.					
d	The project experienced minimal idle time on-site due to waiting for materials or equipment.					
e	The procurement and logistics schedules effectively supported the construction sequence without causing bottlenecks.					

D.2 Cost Performance (Budget Control)

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	The final project cost remained within the approved budget.					
b	Cost overruns, if any, were primarily attributable to supply chain factors (e.g., material price escalation, expedited shipping costs).					
c	The project managed to avoid significant unplanned costs arising from material waste, damage, or rework due to supply issues.					
d	The procurement strategy (e.g., bulk buying, framework agreements) contributed to effective cost control.					
e	Logistics and storage costs were accurately forecasted and controlled.					

D.3 Quality Performance (Conformance to Standards)

No.	Statement	SDA 1	DA 2	N 3	A 4	SA 5
a	The quality of materials and equipment supplied met or exceeded the project's specified standards and requirements.					
b	Supply chain disruptions (e.g., substitutions, rushed deliveries) did not lead to a compromise in the quality of workmanship or final product.					
c	The processes for material inspection, testing, and approval upon delivery to site were effective.					
d	There was minimal rework required due to defects in supplied materials or components.					
e	The installed systems (MEP, façade, etc.) performed as intended upon commissioning, indicating good supply chain quality.					

Section E: Open-ended Questions

Key challenges, effective practices, recommendations

Instruction: Please provide your detailed insights in the spaces provided below. There are no right or wrong answers. We are interested in your professional opinions, experiences, and suggestions. Please write as clearly and specifically as you can.

E.1 Key Challenges (Diagnostic)

a. What were the two or three most critical supply chain-related challenges that significantly hindered the performance of the CBE Headquarters Project (or similar large projects in Ethiopia)? For each challenge, please briefly describe a specific instance and its impact.

b. Among these challenges, which ones do you believe are systemic or recurring issues within the Ethiopian construction industry, rather than unique to a single project? Why?

E.2 Effective Practices (Identification of Success Factors)

a. What specific supply chain management practices, strategies, or tools have you observed or used that were particularly effective in mitigating delays, controlling costs, or ensuring quality in similar projects? Please describe the practice and its positive outcome.

b. Was there any instance of successful collaboration or innovation with a supplier, logistics provider, or subcontractor that helped overcome a major supply chain obstacle? Please describe the collaboration and what made it work.

E.3 Recommendations for Improvement (Prescriptive)

a. From a project management perspective, what specific actions could be taken at the planning stage of a future megaproject to build a more resilient and efficient supply chain?

b. From a policy or industry-wide perspective, what changes are most needed from the government, financial institutions, or industry associations to improve the overall environment for construction supply chains in Ethiopia?

c. Overall Recommendation: If you could give one key piece of advice to the project manager of a future landmark construction project in Ethiopia regarding supply chain management, what would it be and why?

E.4 General Comments

a. Please share any other comments, observations, or lessons learned regarding supply chain management in the Ethiopian construction sector that you feel are important but were not covered above.

Appendix B: Semi-Structured Interview Guide

1. Background: Role, Experience, and Involvement

1. What was your specific role and level of responsibility on the CBE Headquarters Project?
2. Based on your experience, what are the two most distinctive challenges of managing supply chains for large projects in Ethiopia compared to other contexts?

2. Procurement & Suppliers: Selection, Planning, Challenges

1. How did the procurement strategy for key imported materials address (or fail to address) the risks of foreign currency shortages and global supply disruptions?
2. What was the most significant supplier-related challenge encountered, and how did it impact the project schedule or cost?
3. What single change to the procurement or supplier management process would have most improved outcomes on this project?

3. Logistics: Import, Customs, and Site Delivery Issues

1. Which stage of the logistics chain—overseas shipping, customs clearance, inland transport, or on-site handling—posed the greatest delay? Please describe a specific bottleneck.
2. How did logistical constraints influence site planning, sequencing, and inventory management?

4. Information Flow & Coordination

1. Were digital tools or centralized systems effective in providing visibility into material orders and shipment status? What were the main gaps?

2. How were design changes communicated and coordinated with the procurement and supplier network? Provide an example of its effectiveness or failure.

5. Risk Management & Resilience

1. What were the top two supply chain risks formally identified for this project, and what contingency plans were in place?

2. When a major disruption (e.g., COVID-19, forex crisis) occurred, was the response based on pre-existing plans or improvised? What was learned?

6. Impact on Project Performance

1. What percentage of the project's overall delay would you attribute directly to supply chain issues?

2. Beyond schedule, what was the most significant impact of supply chain challenges on project cost or quality?

7. Lessons & Strategic Recommendations

1. Based on this project's experience, what is the single most important lesson for planning the supply chain of a future Ethiopian megaproject?

19. What one policy or industry-level change would most improve the resilience of construction supply chains in Ethiopia?