

THE EFFECT OF SUPPLY CHAIN DIGITALIZATION ON THE LOGISTICS PERFORMANCE OF EAST AFRICA BOTTLING SHARE COMPANY

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The Effect of Supply Chain Digitalization On The Logistics Performance Of East Africa Bottling Share Company

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DECLARATION

I, **Dania Abdulmalik Ebro** declare that the work which is presented in this thesis entitled **"The Effect of Supply Chain Digitalization on the Logistics Performance of East Africa Bottling Share Company"** in partial fulfillment of the requirements for the Degree of Masters of Art in Logistics and Supply Chain Management at Addis Ababa University, is the original work of my own effort and done under the guidance of **Shiferaw Mitiku (PhD)**, and that all the sources of materials used for the study have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other university for the purpose of earning any degree.

Name: Dania Abdulmalik Ebro

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Date _____

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ABSTRACT

Supply chain digitalization has emerged a critical strategy for organizations to improve logistics performance and remain competitive. Nevertheless, a considerable Ethiopian manufacturing companies have yet to capitalize on its potential. This study investigated the effect of supply chain digitalization on the logistics performance of East Africa Bottling Share Company (EABSC). A quantitative, explanatory research design was employed, and structured questionnaires were distributed to 101 employees across supply chain, logistics, IT, and operations departments, yiedling 67 usable responses collected. The data were analyzed using SPSS by descriptive statistics, correlation, and multiple regression analysis. The findings showed that supply chain digitalization at EABSC is implemented at a moderate level across all five SCOR dimensions, with Smart Manufacturing being the most diligently advanced and Reverse Logistics as the least. The regression results confirmed that Digital Planning, Smart Manufacturing, and Intelligent Delivery positively and significantly influence logistics performance, while Reverse Logistics showed an unexpected negative effect. Organizational, technological, and institutional challenges were all identified as moderate barriers to full digitalization. The study recommends that EABSC invest in integrated digital systems, strengthen employee digital capacity, and develop a coherent reverse logistics strategy to fully realize the performance benefits of supply chain digitalization.

Keywords: Supply Chain Digitalization, Logistics Performance, SCOR Framework, EABSC, Ethiopia, Beverage Manufacturing

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

In the current Ethiopian business environment beverage manufacturing companies are expected to improve their logistics performance in regards to their cost efficiency, delivery speed, reliability, and service quality so that they can remain competitive (Shebeshe & Sharma, 2024). Hence, supply chain digitalzation is viewed to be an essential element in beverage manufacturing companies across the continuous nature of production processes that needs vigilant coordination with warehousing and distribution activities (Saryatmo & Sukhotu, 2021). Therefore, supply chain digitalization is becoming an important structure to enhance logistics performance in the beverage industry (Hofmann & Rüsch, 2017). Also, the manufacturing sector of food and beverages shows a really high degree of association amid supply chain activities because of the perishable nature of products, high production volumes, strict quality control requirements, and broad distribution networks (Zhong et al., 2017). So basically supply chain digitalization is the application of digital technologies to improve information sharing, visibility, and decision-making across supply chain activities such as procurement, production, warehousing, transportation, and distribution (Christopher, 2016).

Globally food and beverage manufacturers use digital technologies like Enterprise Resource Planning (ERP) systems, Warehouse Management Systems (WMS), Radio Frequency Identification (RFID), Global Positioning System (GPS) tracking, data analytics, and artificial intelligence to improve their coordination and control throughout their supply chains (Büyüközkan & Göçer, 2018). These technologies

help assist in real-time inventory management, production planning, demand forecasting, and distribution scheduling, that are critical for beverage companies that are operating in fast-moving consumer goods (FMCG) markets (Saryatmo & Sukhotu, 2021). In past studies it is indicated that the integration of such digital technologies has been a pathway to developed logistics performance which includes reduced operational costs, faster order fulfillment, and improved service reliability (Hofmann & Rüsch, 2017). So international beverage and FMCG companies like PepsiCo and Coca-Cola have effectively applied digital supply chain systems in order to improve operational capabilities (Anderson, 2020; Nworie, Odah & Nworie, 2024).

In Africa's context supply chain digitalizaion is emerging as a critical factor of driving operational efficiency in the food and beverage sector, particularly for companies in large-scale productions and extensive distribution network (Kuteyi & Winkler, 2022). Therefore beverage companies that are operating in multiple locations are depending largely on efficient logistics systems for on-time delivery and consistent product availability (Nzuma, 2023). For instance companies operating in Africa such as Coca-Cola bottling partners who have adopted enterprise digital systems such as SAP across their African operations (Mwangi, Kinyua & Muriithi, 2022), also Heineken has sought a global Digital Backbone Transformation Program rolling out SAP throughout its subsidiaries in Africa, so that they can achieve full transparency of product movement from production to delivery (SAP, 2023). Despite this a lot of African manufacturing firms continue to face challenges in adopting digital supply chain technologies because of limitations in infrastructure, shortage of skilled personnel, and high implementation costs (World Bank, 2020).

In Ethiopia, the Ethiopian Beverages Manufacturing Industries Association (EBMIA) which was legally established in 2018 and presently represents over 79 member firms including East Africa Bottling Share

Company (EABSC) which is the subsidiary of Coca-Cola Beverages Africa (CCBA), has identified the support and encouragement of members to implement modern IT systems and automation as one of its core activities (EBMIA, 2022). Despite it although the beverage manufacturing sector plays a huge role in the manufacturing industry, empirical studies show that logistics and supply chain activities in many local beverage companies still remain largely dependent on traditional and semi-manual systems. For example, studies on local beverage manufacturers describe that logistics and distribution activities are mainly managed using conventional traditional approaches with limited application of integrated digital technologies (Geletu, 2013). This indicates that supply chain digitalization is still in its early stage and have yet to advance in the Ethiopian beverage company context: supply chain integration in Ethiopian manufacturing remains more broadly dependent on traditional methods (Georgise et al., 2014), while its role in improving logistics performance remains inadequately examined (Tadesse et al., 2021).

In contrast, EABSC operates in Ethiopia as a large-scale beverage manufacturing company coupled with complex supply chain and logistics operations which includes its warehouoses, production plants and extensive distribution networks (Coca-Cola Beverages Africa–Ethiopia, n.d.). And as part of an ongoing digital transformation program it has implemented enterprise digital systems which includes Microsoft Dynamics ERP, e-commerce platforms, and integrated supply chain planning tools throughout its African bottling operations including Ethiopia and this positions EABSC as having comparatively a lot more developed digital practice in its supply chain compared to many local manufacturers (Coca-Cola Beverages Africa, 2023). However, although its strategic importance of digitalization in the beverage industry, there is limited empirical evidence on how supply chain digitalization effects the logistics performance at EABSC. This creates a research gap that requires an in-depth study on the effect of supply chain digitalization on logistics performance of East Africa Bottling share company.

1.2 Statement of the Problem

The food and beverage manufacturing industry is recognized for its operational challenges that are faced in organizations that are dynamic and competitive markets. This situation is also seen at the EABSC where limitations of logistics performance has been reported. A study carried out at the Jimma branch of EABSC by Mohammed (2020) observed problems that are related to order fulfillment efficiency, delays in customer deliveries and slow logistics services. In addition the study further indicated that logistics performance at EABSC is impacted by high transportation costs, limited operational flexibility, and weak service reliability. These issues indicate gaps in the performance of key logistics functions such as transportation and distribution.

Considering that East Africa Bottling Share Company (EABSC) is one of the largest beverage manufacturing firms in Ethiopia (Coca-Cola Beverages Africa, n.d.), a practical problem exists since the company doesn't have a clear and systematic assessment of the extent to which supply chain digitalization has been implemented across its day-to-day logistics operations. Although supply chain digitalization is generally expected to improve efficiency, accuracy, and overall performance through improved visibility, cost reduction, and faster order processing (Kache & Seuring, 2017). This limits us to determine which supply chain processes is digitally developed and which remain underdeveloped.

Also the mere adoption of digital systems does not necessarily guarantee improved logistics outcomes, particularly if these systems aren't' integrated effectively or developed to a sufficient level across core logistics functions (Dadsena, 2024). Due to this there is limited firm-level empirical evidence demonstrating the extent to which the adopted digital systems have essentially influenced logistics

performance at EABSC. Moreover, despite the recognized importance of supply chain digitalization, there is also little known about the specific institutional, technological, and organizational barriers that hold back its effective implementation at EABSC. Unless these barriers are identifired, efforts to deepen digitalization and improve logistics performance at the company are likely to remain constrained (Dadsena, 2024).

This implies that supply chain digitalization is one of the most effective approaches for beverage manufacturing firms to improve their logistics performance and remain competitive. However, organizations in Ethiopia cannot fully implement supply chain digitalization due to various challenges. Since limited empirical research has been conducted on supply chain digitalization practice, its influence on logistics performance, and the barriers hindering its adoption within the Ethiopian beverage manufacturing industry, conducting a scientific study is essential to address these gaps. It is against this background that this study seeks to assess the extent of supply chain digitalization implementation using the SCOR framework, measure its influence on logistics performance, and identify the barriers hindering its adoption at East Africa Bottling Share Company.

1.3 Research Questions

1. To assess the extent of supply chain digitalization implementation at East Africa Bottling Share Company using SCOR frameworks to plan, source, make, deliver, and return at EABSC?
2. How does supply chain digitalization influence key logistics performance indicators at EABSC, namely order cycle time, inventory turnover, stock out rate, transportation cost efficiency, and
3. order fulfillment rate?What are the institutional, technological, and organizational barriers hindering the implementation of supply chain digitalization systems at EABSC?

1.4 Research Objective

1.4.1 General Objective of the research

The general objective of this research is to examine the effect of supply chain digitization on the logistics performance of East Africa Bottling Share Company.

1.4.2 Specific Objectives of the research

The specific objectives of the study are:

- To assess the extent of supply chain digitalization implementation at East Africa Bottling Share Company using SCOR framework variables, namely plan , source, make, deliver, and return.
- To examine the influence of supply chain digitalization on key logistics performance indicators at East Africa Bottling Share Company, namely order cycle time, inventory turnover, stock-out rate, transportation cost efficiency, and order fulfillment rate.
- To identify the institutional, technological, and organizational barriers hindering the implementation of supply chain digitalization systems at EABSC

1.5 Significance of the Study

This study is significant as it generates empirical evidence on the effect of supply chain digitalization on logistics performance in East Africa Bottling Share Company (EABSC), inside the Ethiopian manufacturing sector. Even though the food and beverage sector, plays an important role in economic development (IFC, 2006), empirical studies on supply chain digitalization in Ethiopia are still very scarce (World Bank, 2018). This study therefore helps to fill the existing research gap and also contributes to the literature on supply chain digitalization in developing countries.

From a practical standpoint, the findings of the study will be useful for the management of EABSC by providing a clear assessment of the current level of supply chain digitalization and identifying major challenges affecting logistics performance. This will support the company in making informed decisions related to digital supply chain systems. Beyond the firm level, the results of the study may also be useful

for other manufacturing firms and policymakers in Ethiopia who are working to modernize supply chain and logistics systems (UNCTAD, 2017; Christopher, 2016). Furthermore the study can also serve as a reference for future researchers that are interested in supply chain digitalization in developing economies.

1.6 Scope of the Study

Among the manufacturing plants operated by East Africa Bottling Share Company (EABSC) in Ethiopia, which are located in Addis Ababa, Sebeta, Bahir Dar, and Dire Dawa, this study is geographically confined to the Addis Ababa plant. The Addis Ababa plant is chosen since it's status is justified as the company's oldest and most established operational sites, which places it at the central role in coordinating supply chain and logistics activities. The practices and systems adopted at the facility are often representative of the company's broader operational approach, making it a suitable location for in-depth analysis.

In addition, the digital systems used at the Addis Ababa plant, such as enterprise resource planning (ERP) and other supply chain technologies, are part of the company's overall digital system. Since these systems are generally implemented at the company level, the Addis Ababa plant can reasonably reflect the digitalization practices of other plants. However, there may be some differences in the level of usage or implementation across branches, and this is considered as a limitation of the study.

The study examines supply chain digitization practices and logistics performance at the selected firm. Assessment of how digitalization impacts logistics performance is led using the five SCOR framework dimensions of Plan, Source, Make, Deliver, and Return, and other supply chain activities outside these dimensions are not included in the scope of the study.

In addition, it identified institutional, technological, and organizational barriers affecting the implementation of supply chain digitalization systems at EABSC to understand factors limiting successful adoption. Other areas outside these aspects were excluded to maintain the focus and manageability of the study.

The study also focus on a cross-sectional assessment of existing supply chain digitization practices at the Addis Ababa plant during the study period. The time limitation will be managed through an extensive

review of relevant empirical and theoretical literature, as well as the use of structured data collection instruments, to ensure that the objectives of the study will be within the available timeframe.

1.7 Organizations of the Study

This research is organized under five main chapters. Chapter One, which is the introductory part, presents the background of the study and the background of the company, followed by the statement of the problem, objectives of the study, basic research questions, significance of the study, as well as the scope and limitations of the study. Chapter Two then deals with the review of literature relevant to the study, beginning with an introduction and followed by the theoretical review and empirical review, and it also presents the conceptual framework of the study. Chapter Three focuses on the methodology of the research and describes the study area, the type and design of the research, the research approach, the study population and sampling techniques, sources of data, data collection procedures and instruments employed, methods of data analysis, validity and reliability of the instruments, and ethical considerations. Chapter Four subsequently presents the results and discussion part of the study, which focuses on summarizing the findings and interpreting and discussing the results. Chapter Five concludes the study by presentencing the summary of findings, conclusions drawn from the results, limitations of the study, and recommendations for future action and research.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Theoretical Literature Reviews

2.1.1 Supply Chain Digitalization Overview

Digital supply chain is currently a significant theoretical advancement in the supply chain and logistics management literature. MacCarthy and Ivanov (2022) have defined digital supply chain as the integration of physical supply chain processes with virtual and digital systems, that are facilitated by enhancements in digital technologies and Industry 4.0. The current growth of the digital supply chain is firstly motivated by globalization, and the many demand for real-time information sharing and coordination across networks (MacCarthy & Ivanov, 2022). Theoretically, digital supply chain depends on technological and organizational bases that encorage connectivity, visibility, and such the likes of it accross logistics activities. Ergo, digital supply chain theory gives an applicable framework for analyzing the effect of digitalization on logistics outcomes, particularly in manufacturing and fast-moving consumer goods sectors operating in unpredictable environments (MacCarthy & Ivanov, 2022).

Hence, supply chain digitalization is related to the integration of digital technologies to the supply chain and logistics processes to support information sharing, coordination, and decision-making (Tiwari et al., 2024; Zhang et al., 2024). Theoretical studies say that digitalization transforms traditional supply chain into a more connected and data-driven systems that allows real-time visibility and process integration via all its logistics activities (Zhang et al., 2024). The current available literature says digital technologies such as the likes of the Internet of Things, artificial intelligence, blockchain, and data analytics all play a crucial role in the advancement of supply chain visibility, coordination, and resilience (Dalain et al., 2025; Samuels, 2025). Hence the technologies are theoretically linked to the betterment in logistics performance by advanced planning accuracy, quicker information flow, and less operational uncertainty (Tiwari et al., 2024; Tian and Cui, 2025). As a result, supply chain digitalization is more so seen as a main organizational

tool bettering logistics performance, specifically in manufacturing and fast-moving consumer goods supply chains (Zhang et al., 2024).

Moreover developments in information technology has transformed supply chain and logistics strategy. As claimed by Bowersox et al. (2020), since 2000, trade has been essentially transformed by computer miniaturization, the Internet, low-cost information transmission capabilities, and omni-channel supply chain operations. Information defined by efficiency has been the norm, and had been enabling better business-to-business and business-to-consumer transactions. Hence these advancements have bettered the role of digital technologies as a base for integrated and alert supply chain and logistics systems (Bowersox et al., 2020).

Ergo, high internet entry and repeated access to information has strongly warned consumer buying behavior and demand patterns. Consumers are more and more able to compare products and prices easily, which suggests a lot more expectation related to performance. As stated by Agrawal and Narain (2018), these changes impose substantial pressure on supply chain managers to improve coordination, responsiveness, and efficiency across logistics activities. In response, firms are increasingly relying on digital approaches to manage growing supply chain complexity and customer expectations.

In addition, supply chain digitalization is applied for the uptake of specific digital technologies. This literature review shows a range of technologies that supports the change of traditional supply chains to digital ones, which includes the Internet of Things, advanced analytics, blockchain technology, and many more (Bigliardi et al., 2022). These technologies supply the technological foundation for synchronization across supply chain and logistics processes.

2.1.2 Theoretical Frameworks of Supply Chain Digitalization

The research of how digitalization affects the supply chain digitalization of EABSC can be understood better by looking at it from viewpoints. These viewpoints help us understand how digital technologies are used and how they make the logistics work better. The study of digitalization and its impact on the beverage supply chain is important to see how digitalization helps the beverage supply chain. Digitalization has a role to play in the beverage and beverage supply chain and its logistics performance.

The beverage supply chain performance can be improved with the help of digitalization and its effects, on the beverage supply chain.

2.1.2.1 Technology Organization Environment (TOE) Framework

The Technology Organization Environment (TOE) framework explains how firms adopt and implement new technologies based on three key contexts: technological, organizational, and environmental factors (Tornatzky & Fleischer, 1990). The technological context refers to the availability and characteristics of digital tools such as enterprise systems, tracking technologies, and data analytics. The organizational context includes factors such as firm size, management support, employee skills, and financial resources. The environmental context considers external influences such as competition, industry trends, and government regulations.

The TOE framework has been well used to explain on technology adoption, which shows how both internal and external factor influence execution (Chau & Tam, 1997; Zhu et al., 2006). Which is why the TOE framework supports first research objective by explaining the level of supply chain digitalization implementation through the SCOR dimensions and supports the third research objective by identifying technological and organizational factors influencing digitalization implementation barriers at EABSC.

2.1.2.2 Resource-Based View (RBV)

The Resource-Based View (RBV) explains that firms attain competitive advantage by efficiently using valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). It also sees organizations as a pack of resources or assets, where any differences in these resources can lead to alos another differences in performance (Grant, 1991).

Ergo, in supply chain digitalization, any technology like big data analytics, cloud computing, and the Internet of Things (IoT) could be regarded as strategic resources. Hence, when effectively used, these technologies will better performance across logistics operations, leading to emhanced logistics performance results like reduced order cycle time, improved inventory turnover, and higher order fulfillment rates (Peteraf, 1993).

Consequentially RBV has been broadly in supply chain management to elaborate how digital capabilities

better performance. Nevertheless, it is questioned for lacking clarity when explaining how firms get these resources and also for focusing particularly on internal factors (Gautam & Prabhakar, 2019).
Although these limitations, RBV is important to this research since it validates research objective two and elaborates on how digital technologies and abilities adds to bettering logistics performance at East Africa Bottling Share Company (EABSC).

2.1.2.3 Supply Chain Integration Theory

Supply Chain Integration Theory highlights the value of coordination and collaboration throughout many different functions within the supply chain. It concentrates on the integration of internal processes as well as relationships with external partners like sppliers and distributors (Mentzer et al., 2001).
Ergo, effective integration allows better coordination across the supply chain. In addition, empirical studies have shown that higher levels of integration can lead to enhanced operational performance and better relationships among supply chain partners (Zhao et al., 2008). Consequentally, Supply Chain Integration Theory supports the first research objective by elaborating on digital integration across SCOR framework dimensions and also supports research objective two by demonstrating how integration improves logistics performance results.

2.1.3 SCOR Framework and Supply Chain Digitalization

The Supply Chain Operations Reference (SCOR) model is a cross-industry process reference framework originally developed in 1996 by the management consulting firms Pittiglio, Rabin, Todd and McGrath (PRTM) and AMR Research, under the auspices of the Supply Chain Council (SCC) (ASCM, 2022; Stewart, 1997). Subsequently to the integration of the SCC with APICS in 2014, the model has been supervised and improved by the Association for Supply Chain Management (ASCM), so it makes it globally known in practice de for supply chain performance measurement and process advancement (ASCM, 2022). SCOR offers a cohesive structure that connects infrastructures across six core process domains namely, Plan, Source, Make, Deliver, Return, and Enable which enables organizations to asses

supply chain performance in and through organizational boundaries (APICS, 2017).

Thus, the SCOR framework is developed for facilitating effective communications to both organizations and across supply chain partners by offering standardization for performance measurement and benchmarking (Bowersox et al., 2024). So, integrating digital technologies into SCOR processes allows organizations to decrease operational costs, improve delivery speed, enhance agility, and strengthen general logistics performance. Consequently, the SCOR framework grants both a theoretical and practical ground for checking how supply chain digitalization adds to logistics performance progress.

As a result, the recent developments in supply chain management has provides more focus on the flourishing role of digitalization within the SCOR framework. As stated by El Hilali et al. (2020), technologies as the likes of Artificial Intelligence (AI), Internet of Things (IoT), Big Data Analytics, Cloud Computing, Blockchain, and Enterprise Resource Planning (ERP) systems are more and more integrated into supply chain operations to improve its agility (efficiency, visibility, flexibility, and responsiveness). So, these technologies allows operational efficiency throughout the supply chain networks.

2.1.4 Supply Chain Digitalization (SCD) Practices

The integration of digital tools into supply chain operations reveals a paradigm shift from linear processes to an interconnected digital ecosystem. Following the functional stages of the SCOR model, researchers have identified distinct constructs and practices that define modern digitalization. Each stage draws on a specific combination of information systems, tracking technologies, data analytics, automation, and digital communication tools which are the key digitalization enablers examined in this study.

2.1.4.1 Digital Planning

To begin with, the "Plan" stage is the unification of Information Systems and Data Analytics behavior as the primary force for Integration. Information technology allows organizations to store, process, and transmit huge volumes of logistics-related data, assisting the unification the of logistics functions

throughout procurement, production, warehousing, and distribution activities (Stevenson, 2021). Furthermore, a key enabler is cloud computing, which houses functions of the likes ofb Enterprise Resource Planning (ERP), Warehouse Management Systems (WMS), and Transportation Management Systems (TMS), offering on-demand reach to computing resources and real-time data accessibility crucial to agile supply chain management (Bowersox et al., 2020).

In addition, ERP systems are particularly important at this stage because they initiate, monitor, and track supply chain activities such as order fulfillment, inventory management, and replenishment across a unified corporation database, simultaneously encouraging the other functions like financial and human resource (Bowersox et al., 2020). As noted by the Association for Supply Chain Management (2025), the transformation into the SCOR Digital Standard (SCOR-DS) has further necessitated a connected data of information model that helps digital twins. Hence, in academic literatures it highlights that Data Analytics practices, allows organizations to transform from historical data to now predictive foresight (Liu & Chiu, 2021). So, these analytics, assisted by AI and machine learning algorithms allow Digital Communication channels to harmonize sales and operations planning (S&OP) in real-time, consequentially decreasing information imbalance that traditionally contributes to the bullwhip effect (Bigliardi et al., 2022).

2.1.4.2 Digital Sourcing

Secondly the "Source" stage uses Tracking and Identification technologies with Automation to transform supplier relationship management. So, barcoding, RFID, and Blockchain all form the identification pillar of digital sourcing because RFID allows wireless data transmission across electronic tags, and supports a lot more comprehensive tracking of goods, and seamlessly integrated with Warehouse Management Systems, which offer better traceability in contrast to traditional barcodes (Stevenson, 2021; Blanchard, n.d.). Therefore, digital procurement practices draw on these technologies to guarantee the origin and sustainability compliance of raw materials which creates a constant audit trail (Tiwari et al., 2024).

Ergo, automation in this stage materializes across e-sourcing platforms and also smart contracts that process payments automatically after digital verification of delivery. In addition, block chain has the ability to provide greater strength by allowing secure and transparent information sharing, handling

concerns in relation to data consistency and protection (Bowersox et al., 2020). Moreover, the digital Communication tools including e-mail, mobile communication, and internet platforms can support a plug-and-play supplier ecosystem in which data flows easily bwtween buyers and vendors; this allows real-time risk monitoring and automated tendering processes (Adjei-Bamfo et al., 2024; Stevenson, 2021).

2.1.4.3 Smart Manufacturing

Thirdly the "Make" stage focus on Automation and Internet of Things (IIoT). So, IoT connects physical objects across the internet, RFID, and sensors, which allows huge volumes of operational data to be repeatedly created from smart devices in factory floors (Ben-Daya et al., 2019; Paksoy, Koçhan and Ali, 2020). Hence, this area is known by cyber-physical unification, in which Information Systems connect factory-floor machines to wider ERP systems. So, tracking and Identification technologies all track work-in-progress (WIP) components with precision, while Data Analytics and AI and machine learning all are in used on machine sensor data to push Predictive Maintenance, which allows systems to predict failures, self-configure, and adapt to sudden changes in the operating environment (Zhang and Lee, 2024; Hugos, 2018).

Ergo, this integration guarantees that production is not only automated but it also guarantees insight when using Digital Communication protocols which allows machines to self-adjust according to real-time quality data and production schedules (F1000Research, 2026). Hence, automation in this case decreases manual action and human error which contributes to a more reliable operations (Stevenson, 2021).

2.1.4.4 Intelligent Delivery

Fourthly the "Deliver" stage reflects one of the most mature uses of tracking and identification and digital Communication. For instance, real-time transportation visibility (RTTV) is achieved by the integration of GPS and IoT-based Tracking and Identification technologies which provides ongoing pipeline of data to Information Systems (Zhao et al., 2023). So, GPS technologies allow logistics managers to track vehicle movement, get electronic notifications in reference to delivery status, and to flexibly make the most of

transportation routes and deliveries which contributes to improved responsiveness and efficiency (Chopra, 2019).

Ergo, data Analytics then process this location and environmental data to maximize flexible routing and fleet management. And, in the warehouse, WMS improves efficiency by connecting the physical inventory with the electronic records and by helping real-time data processing (Chopra, 2019). So, Automation in the form of Autonomous Mobile Robots (AMRs) is then synchronized through digital communication networks which guarantees that inventory movements are tracked and updated immediately, and this significantly improves order fulfillment accuracy and its speed (Scholars Middle East Publishers, 2026). Notably, the integration of ERP, WMS, and TMS, usually allowed across cloud computing guarantees smooth information flow over logistics activities (Chopra, 2019).

2.1.4.5 Reverse Logistics

Fifthly the "Return" stage more and more depends on data analytics and automation to handle the complications of circular supply chains. Thus, big data analytics which is described as an advanced analytical technique is used on huge volume of sophisticated and variable data and it allows organizations to recognize changes in product return trends, boosts decision-making, and also helps mass customization strategies (TechAmerica Foundation, 2012; Lee and Lee, 2015). So, digitization practices in reverse logistics use Information Systems to label returned products and identify their best inclination path (resale, recycle, or refurbish) by automated decision-logic. So, tracking and identification tools like digital product passports, supply the necessary data on product lifecycle and material composition (Frontiers, 2026).

Furthermore, this is backed by digital communication gateways that automate the customer return link by using Data Analytics to improve the last-mile of the return journey through consolidating shipments and decreasing general recovery process (Khor et al., 2025). In addition, cloud-based systems provide the versatility that is needed to handling the complexity of reverse logistics flows by guaranteeing data credibility across the returns process (Bowersox et al., 2020).

2.1.5 Logistics Management

As stated by Christopher (2016) “Logistics management refers to the planning, implementation, and control of the efficient and effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customer requirements”. Critically, as a core component of supply chain management it also involves the alignment of material flows accross the organization by encompassing inbound and outbound transportation, material handling, warehousing, inventory, order fulfillment, and reverse logistics (Stevenson, 2021, p. 685).

Hence, effective logistics management needs synchronization through all the supply chain stages because coordination can only be achieved when individual logistics decisions are placed under wider organizational goals (Chopra & Meindl, 2016). Richey et al. (2022) has further stressed that this coordination must be flexible and organizations must arrange logistics activities in response to more an more changing customer needs and their operational conditions significantly in mass manufacturing environments.

Furthermore, in manufacturing firms logistics management includes core functions like the likes of transportation, inventory management, warehousing, order processing, packaging, and reverse logistics (Christopher, 2016). And the effective coordination of these functions is important for achieving strategic fit between responsiveness and efficiency in which remains a central challenge of supply chain management (Chopra, 2019). Ultimately, the effectiveness of these logistics activities is often assessed by means of logistics performance in which it shows how efficiently and effectively logistics operations upholds organizational objectives.

2.1.6 Logistics Performance

What Logistics performance stands for is the efficiency and effectiveness in which goods are transported, stored, and delivered across a supply chain. It also reflects a country’s or an organization’s ability to handle logistics activities like customs, infrastructure, shipment reliability, tracking, and timeliness (World Bank, 2023).

Hence, logistics performance is influenced by the supply chain strategy inside where logistics activities are carried out. Bowersox et al. (2024) states that supply chain strategy offers an operational structure which guides logistics functions. Also, traditionally organizations have supposed that refining individual logistics functions is going to automatically improve system performance. And, this functional focus has for a long time guided organizational frameworks and performance measurement systems but could also limit the understanding of how logistics activities influence performance (Bowersox et al., 2024).

In addition, logistics performance is also impacted by performance risk that arises when logistics partners don't meet delivery schedules, quality criteria, audit conditions, or capacity demands. So, such failures decrease a firm's capability to deliver products in the required conditions leading to lower logistics performance (Bowersox et al., 2024).

Therefore, maintaining logistics performance requires the capability to address obstacles and changing demand. Bowersox et al. (2024) pointed out that logistics systems must adjust to the current challenges to sustain their performance. So, performance metrics are necessary for deciding whether logistics systems are performing as predicted or whether corrective actions are needed (Stevenson, 2021).

Thus, measuring the logistics performance assists managerial decision-making by pointing out inefficiencies and aligning logistics activities alongside business objectives (Gunasekaran et al., 2004). Also, Bowersox et al. (2024) has further highlighted that unified performance measurement systems are important to handle internal logistics activities and relationships among all the supply chain partners.

Therefore, logistics performance indicators used in this study are adopted mainly from the performance measurement framework proposed by Gunasekaran, Patel, and Tirtiroglu (2001), who has identified operational indicators like order cycle time, inventory performance, delivery responsiveness, and service effectiveness as critical measures of supply chain performance. In addition support for transportation efficiency and order fulfillment measures is obtained from Christopher (2016), Bowersox, Closs, and Cooper (2013), and Frazelle (2002). Hence, accordingly, order cycle time, inventory turnover, stock out rate, transportation cost efficiency, and order fulfillment rate are chosen as the suitable indicators for assessing logistics performance in this study since they clearly and directly measure logistics efficiency, responsiveness, inventory effectiveness, transportation operations, and customer service outcomes.

2.1.6.1 Order Cycle Time

Firstly, order cycle time is in reference to the total time needed from the moment a customer places an order till the order is delivered to the customer. It is one of the most essential indicators of logistics performance since it measures the responsivity and efficiency of logistics operations. So, efficient order cycle time shows effective coordination amidst inventory management, warehousing, transportation, and order processing activities (Christopher, 2011).

Furthermore, Bowersox et al. (2024) states that shorter order cycle times advance customer satisfaction and organizational competitiveness by guaranteeing on-time delivery of products and services. Therefore, firm's usually measure order cycle time via calculating the average time taken to process, pick, transport, and deliver customer orders. As such, delays in any logistics activity could increase order cycle time and could also negatively affect service performance. Finally, Gunasekaran, Patel, and Tirtiroglu (2001) have further identified order cycle time as an essential operational performance indicator in supply chain and logistics management since it directly shows logistics agility.

2.1.6.2 Inventory Turnover

Secondly, inventory turnover measures how efficiently inventory is exercised inside the logistics system via showing how many times inventory is sold, replaced, or used during a specific period of time. Hence, it is an essential logistics performance indicator because it shows the effectiveness of inventory management practices and product movement through the supply chain (Chopra and Meindl, 2016).

Furthermore, higher inventory turnover shows efficient inventory use and decreased holding costs, although low turnover could also indicate surplus inventory or weak demand management as stated by Christopher (2011), inventory turnover is vastly used to check logistics and supply chain efficiency since inventory usually represents a huge portion of organizational working capital. Bowersox et al. (2024) further also states that improved inventory turnover aids to improved cash flow, lesser storage costs, and boosted operational efficiency inside logistics operations.

2.1.6.3 Stock Out Rate

Thirdly, stock out rate is in reference to the occurrence at which inventory becomes unavailable while customer demand occurs. So, it is an essential; indicator of logistics performance since it shows the organization's capability to sustain sufficient adequate inventory levels and also guarantee product availability for customers. Hence, Bowersox et al. (2024) stated that stock outs negatively affect customer satisfaction, organizational reputation, and sales performance because customers could encounter delays or shift from suppliers when products are unavailable. Christopher (2011) thus, further emphasizes that minimizing stock out rates is important for boosting customer service performance and supply chain responsiveness.

Furthermore, Chopra (2019) also stated that organizations usually sustain high inventory levels and safety stock to prevent stock outs since stock out costs can strongly affect organizational profitability. However, excessive inventory may also increase holding costs and tie up significant working capital. Therefore, this highly indicates the necessity of balancing inventory availability with inventory cost efficiency in logistics operations.

2.1.6.4 Transportation Cost Efficency

Fourthly, transportation cost efficiency is in reference to the capability of an organization to decrease transportation-related costs meanwhile sustaining effective delivery performance. Chopra and Meindl (2016) further states that transportation is one of the main logistics cost components accross the supply chain. Hence, the authors further explained that advancements in supply chain design and transportation systems assist organizations decrease fuel consumption, transportation misuse, and overall logistics costs. So, as fuel prices proceed to increase organizations are more and more so obligated to refine transportation efficiency by better logistics planning and also network design.

Moreover, Christopher (2011) states that effective transportation management plays a role to improve delivery reliability, decrease operational cost, and enhance customer service performance. So, in a simillar way, Bowersox et al. (2024) elaborates that practices like route optimization, shipment consolidation, and efficient use of transportation vehicles take part in an essential role in upgrading transportation efficiency as well as reducing logistics costs.

Ultimately, Chopra and Meindl (2016) also argues that sustaining higher inventory levels could sometimes decrease transportation costs by economies of scale in transportation and production activities. So, this shows that transportation efficiency is closely linked with inventory management and general supply chain operational decisions.

2.1.5.5 Order Fulfillment Rate

Fifthly, order fulfillment is one of the logistics performance indicators that has gained much attention from scholars. For instance, as Stevenson (2021, p. 706) elaborates, order fulfillment stats when a warehouse download a store's order to its information system, and then this process entails responding to customer orders where fulfillment time becomes an essential factor based on the degree of customization is needed. In addition to this, Chopra (2019, p. 13) further stated that order fulfillment takes place from products that alredy kept in inventory which are builded up before customer orders even arrive.

Moreover, asccording to Bowersox et al. (2024), order fulfillment performance measures the capability of a firm to satisfy customer requirements in a dependable manner, making it a valiuable indicator for examining logistics performance. Thus, Christopher (2011) also explaines that order fulfillment is highly related to customer satisfaction since customers always expect their products to be delivered in the right quantity, condition, and time. Similarly, Frazelle (2002) has identified order fulfillment as a necessary logistics service indicator utilized to evaluate operational reliability and customer service effectiveness. Ultimately, from all these scholars it is clear that order fulfillment straightforwardly reflects the ability of the supply chain to satisfy customer expectations.

2.2 Empirical Literature Review

The empirical literature on supply chain digitalization and its effects on logistics performance has grown substantially but evidence from developing economies and firm-level studies still remains limited. Globally, using digital technologies in supply chains shows improvement in efficiency. For example, Big data analytics build-in planning and delivery processes were observed to improve demand forecasting and delivery reliability (Chehbi-Gamoura et al., 2020), and digital transformation has also proven to

significantly improve supply chain performance across the SCOR dimensions (Oubrahim, Sefiani, & Happonen, 2023). In a similar way embedding digital tools to the Deliver and Return processes was founded to improve organizational coordination effectively than internally focused IT systems alone (Rashid et al., 2024).

The relationship between supply chain digitalization and logistics performance has been largely studied and a lot of findings show a positive association. Supply chain visibility, coordination, and decision-making were observed to be improved across digital technologies, enhancong cost efficiency, customer service, and asset management (Büyüközkan & Göçer, 2018). Also, digitalization was founded to improve resilience and operational performance by enhanced information sharing decreasing logistics costs and delivery lead times (Zhao et al., 2023). In the food and beverage sector specifically, digital supply chains were found to considerably improve optimization of cost, productivity, and cost reduction the greatest benefits coming from the digital integration in procurement and manufacturing planning (Saryatmo & Sukhotu, 2021). Evidence from multinational beverage firms such as The Coca-Cola Company and PepsiCo further supports these findings, because AI, IoT, and digital twin technologies are being utilized to optimize procurement, delivery reliability, and quality control (Büyüközkan & Göçer, 2018).

However, not all the studies reported consistntly positive outcomes. For example, Wu (2025) found a "digitalization paradox," where supply chain digitalization decreased performance due to higher operational and management costs when firms were moving from old systems. Conditions like supplier opportunism, employee resistance, and shortages of skilled personnel further discovered that it weakens performance outcomes when fragmented digitalization without a sufficient organizational integration produce only limited improvements in logistics performance (Guo et al., 2023; Buntak et al., 2021; Liu, 2025). These empirical findings show that improvement in performance depends on a good implementation and the organization's readiness.

Inside the African and Ethiopian context empirical evidence on SCOR-based supply chain digitalization still remains limited. For instance, planning and delivery processes were shown to stay the least digitally mature across African manufacturing sectors because of a fragmented IT infrastructure and also a limited ERP adoption (Malatji, 2024). Also, in Ethiopia, the electronic Logistics Management Information System

(eLMIS) showed that it improvs inventory visibility and distribution planning, but still its implementation continues to face challenges that are related to poor system integration and a limited user adoption (Mekonen et al., 2025). At an organizational level, vehicle availability, route planning, and information flow were discovered as the major factors of logistics performance at East Africa Bottling Share Company, while ongoing dependence on manual processes identifies gaps in digital implementation (Mohammed, 2020).

In addition, studies on bariers and challenges on supply chain digitalization identify institutional, technological, and organizational constraints as main obstacles. For instance, weak regulatory systems, and an unreliable infrastructure, also limited financing were discovered to exert negative efects in developing countries compared to developed economies (Zhu et al., 2010; UNCTAD, 2023). In regards to Ethiopia unstable electricity supply, fragile broadband infrastructure, and also limited government support are identified as some of the major challenges for manufacturing firms (Mesfin & Raju, 2021), while also weak change management, and a rigid organizational culture were discovered as key organizational barriers limiting digital adoption (Habtamu, 2022; Tadesse, 2020). In the regional level a poor system compatablity, high implementation costs, and poor partner digital readiness were discovered to further restrict supply chain performance improvements (Park, Hain, & Jurowetzki, 2021).

2.3 Literature Gap

Most of the existing literature on supply chain digitalization and logistics performance lacks precise firm-level empirical evidence on how to measure the degree of digitalization implementation across specific supply chain processes in developing country manufacturing contexts. Instead of examining digitalization throughout all supply chain operations systematically, researchers tend to focus on broad sectoral or national-level assessments without applying the SCOR framework dimensions of Plan, Source, Make, Deliver, and Return to measure digitalization at the level of an individual firm. As a result the findings reported in existing literatures are too generic to produce any clear consequences for logistics performance in terms of specific operational metrics such as order cycle time, inventory turnover, and order fulfillment rate within a single firm context.

Despite increasing discussions about implementing digital technologies to improve supply chain

coordination and logistics outcomes, there are very few quantitative firm-level studies that demonstrate the degree to which supply chain digitalization has actually been implemented within private beverage manufacturing firms in Ethiopia. The existing Ethiopian studies are largely restricted to public sector supply chains such as pharmaceutical and transport logistics, leaving a significant evidence gap with respect to private fast-moving consumer goods manufacturers like East Africa Bottling Share Company. Furthermore, while Mohammed (2020) identified logistics performance gaps at EABSC, the study did not asses digitalization implementation through the lens of the SCOR framework, leaving the firm-specific measurement gap unresolved.

Finally, the data on which existing research's base their generalizations is largely from multinational corporations or public institutions in developed and emerging economies, making it difficult for private beverage firms operating in infrastructure-constrained environments like Ethiopia to draw actionable conclusions. Notably no study found in the reviewed literature has simultaneously addressed SCOR-based digitalization implementation, its quantifiable influence on logistics performance, and the institutional, technological, and organizational barriers constraining its adoption inside a single firm-level study in the Ethiopian beverage industry. This study therefore seeks to fill these gaps.

2.4 Conceptual Framework

From the above literatures gathered, the below conceptual framework can be drawn. This framework shows the relationship between supply chain digitalization and logistics performance at East Africa Bottling Share Company (EABSC). Supply chain digitalization is considered the independent variable and is operationalized through five SCOR-based dimensions: Digital Planning, Digital Sourcing, Smart Manufacturing, Intelligent Delivery, and Reverse Logistics. Alos, logistics performance is the dependent variable and is measured using five indicators: order cycle time, inventory turnover, stock-out rate, transportation cost efficiency, and order fulfillment rate.

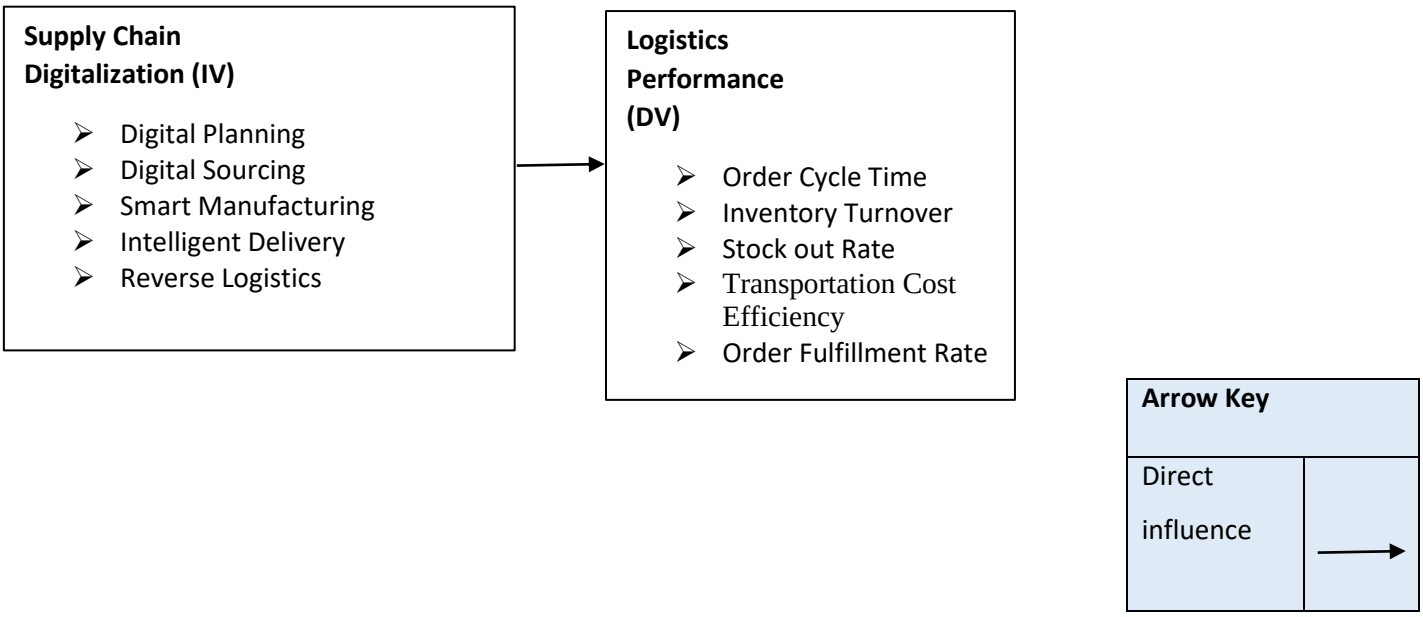


Figure 2.4 Conceptual Framework

(Source: (Develop by researcher based on Theoretical and Empirical review, 2026))

CHAPTER THREE

3. RESEARCH DESIGN AND METHODS

In this section the researcher presents the research design and methodology. So the research design, sample size (sampling frame) and sampling technique, the type of data source and the data collection method, procedure of data collection, questionnaire is going to be explained. The last section was depicting data analysis method.

3.1 Description of the Study Area

This study was conducted at East Africa Bottling Share Company (EABSC), one of the leading beverage manufacturing companies operating in Ethiopia. The company runs multiple production plants and distribution networks throughout the country and its headquarters is located in Addis Ababa. EABSC holds a considerable role in Ethiopia's manufacturing and logistics sector and it also has progressively adopted digital technologies in its supply chain and logistics operations. Given its operational scale, well-structured supply chain system, and ongoing digital transformation effort **(**CCBA Group, n.d.; Food Business Africa, 2025**)**, the company provides a suitable context for examining the effect of supply chain digitalization on the logistics performance.

3.2 Research Design

The study applied an explanatory research design to examine the effect of supply chain digitalization on logistics performance at East Africa Bottling Share Company. The design was considered appropriate because the study aimed to identify and explain the relationship between supply chain digitalization dimensions and logistics performance indicators. The design allows the researcher to analyze how digital planning, digital sourcing, smart manufacturing, intelligent delivery, and reverse logistics influence logistics performance inside the organization.

3.3 Research Approach

The study adopted a quantitative research approach which was selected because it allowed the researcher to gather numerical data and analyze it statistically to examine the relationships between variables. The quantitative approach also supported the objective measurement of supply chain digitalization practices and logistics performance indicators.

The study followed a positivist research approach because it focused on measurable variables and objective findings by statistical analysis. Data was collected using structured questionnaires with Likert-scale responses ranging from 1 to 5. The collected data were analyzed using Statistical Package for Social Sciences (SPSS) software through descriptive statistics, correlation analysis, and regression analysis to examine the relationship amid supply chain digitalization and logistics performance indicators. Hence why the quantitative approach was considered appropriate for achieving the objectives of the study.

3.4 Population and Sampling Technique

3.4.1 Target Population

As defined by Saunders and Lewis (2012), population refers to the complete set of elements relevant to a particular study. Since the main objective of this study was to examine supply chain digitalization, its influence on logistics performance, and barriers affecting its implementation, the target population was selected based on their involvement and knowledge regarding these activities.

Therefore, the target population of this study consisted of employees of East Africa Bottling Share Company who were involved in logistics, supply chain, operations, and information technology activities. These employees were selected because they possessed relevant knowledge and experience regarding supply chain digitalization practices and logistics operations within the company.

3.4.2 Sampling Technique

The process of selecting a number of study units from a defined population is called sampling. The sampling technique employed for this study was purposive sampling. Purposive sampling was considered appropriate because it enabled the researcher to select respondents who had direct involvement in supply chain, logistics, operations, and information technology activities within the organization.

The selected respondents were employees of East Africa Bottling Share Company who possessed relevant knowledge and experience regarding supply chain digitalization practices and logistics performance. The technique helped the researcher obtain relevant information from respondents with adequate understanding of the study variables. According to Yamane (1967) sample size determination formula,

$$n = \frac{N}{1 + Ne^2}$$

Where:

n= number of sample size (100)

N= Total number of study population (135)

e= Level of precision (5%)

$$n = \frac{135}{1 + 135(0.05)^2}$$

$$n = \frac{135}{1 + 135(0.0025)}$$

$$n = \frac{135}{1 + 0.3375}$$

$$n = \frac{135}{1.3375}$$

$$n = 100.93$$

Since the sample size must be a whole number, we round up to the next whole number.

Required Sample Size (n) = 101

So, the sample size of study was 101 employees

Target population, out of the total Size of target population 135 researchers takes a sample size of 101.

3.5 Data Types and Sources

The study used both primary and secondary sources of data.

3.5.1 Primary Data

Primary data refers to original data collected directly from respondents. In this study, primary data was collected using structured questionnaires containing close-ended questions measured using a five-point Likert scale.

3.5.2 Secondary Data

These types of data for this research were collected from reading different literature from the internet and in the library. Sources such as websites, books, and journals released by the supply chain management organizations were also used. Data collection method that was used in this research is self-administered questionnaire that comprises both open end and closed end question

3.6 Method of Data Collection

The study used structured questionnaires as the main data collection instrument. The questionnaire consisted of demographic questions and Likert-scale items related to supply chain digitalization and logistics performance.

The questionnaires were distributed electronically through Google Forms to employees of East Africa Bottling Share Company. Google Forms was selected because it enabled efficient data collection, easy accessibility for respondents, faster response gathering, and simplified organization of data for analysis.

3.7 Validity and Reliability

The validity and reliability of the research instrument were assessed to ensure the quality and consistency of the collected data.

3.7.1 Validity Test

Validity refers to the extent to which the research instrument measures what it is intended to measure. To ensure content validity, the questionnaire items were developed based on previous literature and the SCOR Model framework. In addition, the questionnaire was reviewed by the research advisor to ensure clarity, relevance, and appropriateness of the items.

3.7.2 Reliability Test

Reliability was assessed using Cronbach's Alpha in IBM SPSS Statistics, with 0.70 set as the acceptable threshold for internal consistency (Nunnally, 1978; George & Mallery, 2003). As shown in Table 3.7, Reverse Logistics ($\alpha = 0.7$) and Logistics Performance ($\alpha = 0.9$) met this threshold, while Digital Planning, Digital Sourcing, and Smart Manufacturing each recorded $\alpha = 0.6$, and Intelligent Delivery returned the lowest value of $\alpha = 0.5$. Hair et al. (2010) suggest that values between 0.60 and 0.70 remain acceptable in exploratory research, and DeVellis (2016) notes that borderline scores do not necessarily invalidate a scale, particularly for multidimensional constructs. Nevertheless, the $\alpha = 0.5$ recorded for Intelligent Delivery is acknowledged as a limitation, possibly reflecting the heterogeneous nature of its items or the novel application of the SCOR framework in the Ethiopian logistics context. Future studies are encouraged to refine and revalidate these scales accordingly.

Table 3.1: Reliability Analysis Results (Cronbach's Alpha)

Variable / Construct	Cronbach's Alpha	Number of Items
Digital Planning	0.6	5
Digital Sourcing	0.6	5
Smart Manufacturing	0.6	5
Intelligent Delivery	0.5	5

Reverse Logistics	0.7	5
Logistics Performance	0.9	15

Source: Own SPSS output (2024)

3.8 Methods of Data Analysis

The collected data was coded, entered, and analyzed using IBM SPSS Statistics.

The following statistical methods were employed:

3.8.1 Descriptive Statistics

Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize demographic characteristics and respondents' perceptions regarding supply chain digitalization and logistics performance.

3.8.2 Correlation Analysis

Pearson correlation analysis was used to examine the relationship between supply chain digitalization dimensions and logistics performance.

3.8.3 Regression Analysis

Multiple linear regression analysis was used to determine the effect of supply chain digitalization dimensions on logistics performance.

The regression model of the study is expressed as:

$$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\varepsilon$$

Where:

- Y = Logistics Performance
- X1 = Digital Planning
- X2 = Digital Sourcing

- X3 = Smart Manufacturing
- X4 = Intelligent Delivery
- X5 = Reverse Logistics
- $\beta 0$ = Constant term
- ε = Error term

3.9 Ethical Considerations

Most research would be difficult to perform since some of it would elicit requirements and include ethical issues that must be met by the researcher in order to raise and ensure the reliability and validity of the research findings. Depending on the nature of the research, ethical considerations can take many different shapes. By completing the required steps, the researcher was able to meet some ethical considerations for this research or study. Furthermore, the researcher received formal confirmation from respondents to participate in the data collection activity, and the researcher did not attempt to use any force or sympathy on the respondents, and the data was collected confidentially. The nature of this survey was also kept in mind so that the research respondents may react freely and without fear of implication.

CHAPTER FOUR

4. DATA ANALYSIS

This chapter presents various data obtained from the research participants analyzed though SPSS. It consists of characteristics of the respondents (demographic variables) in terms of their sex, age, educational qualification and also work experience. Besides, it contains data obtained by making use of questionnaire, and document analysis with detailed interpretation of all the collected data.

4.1 Response Rate

A total of 101 questionnaires were distributed electronically using Google Forms to employees working across the supply chain, logistics, IT, and operations departments of EABSC. Out of that 67 were completed and returned which shows 66.3% of a response rate. According to Mugenda and Mugenda (2003), a response rate of 50% or above is acceptable for analysis and reporting so the 66.3% response rate obtained in this study was acceptable for the purpose of analysis.

Table 4.1: Questionnaire Distribution and Response Rate

Distributed Questionnaires	Returned and Usable	Response Rate (%)
101	67	66.3%

Source: Own SPSS output (2026)

4.2 Demographic Profile of Respondents

The demographic characteristics of the 67 respondents are shown in the consolidated *Table 4.2* below, and covers gender, age range, department, and years of experience. A combined presentation is used to facilitate a holistic view of the sample profiles.

Table 4.2: Demographic Profile of Respondents

Category	Sub-category	Frequency	Percent (%)
Gender	Female	46	68.7
	Male	21	31.3
Total		**67**	**100.0**
Age Range	18–25	19	28.4
	26–35	38	56.7
	36–45	9	13.4
	Above 45	1	1.5
Total		**67**	**100.0**
Department	IT	4	6.0
	Logistics	28	41.8
	Operations	1	1.5
	Other	3	4.5

Category	Sub-category	Frequency	Percent (%)
	Supply Chain	31	46.3
Total		**67**	**100.0**
Years of Experience	0–5 years	29	43.3
	6–10 years	34	50.7
	11–15 years	0	0.0
	Above 15 years	4	6.0
Total		**67**	**100.0**

Source: Own SPSS output (2026)

As shown in *Table 4.2* Item one, from the total of 67 respondents, 46 (68.7%) of them were Female and 21 (31.3%) of them were Male. This implies that the majority 46 (68.7%) of employees that respondents were Female for this study.

On Item two, 19 (28.4%) of the respondents fall in the age group of 18–25, 38 (56.7%) are in the age group of 26–35, 9 (13.4%) are between 36–45, and 1 (1.5%) is above 45 years. This shows that the majority 38 (56.7%) of respondents are in the age group of 26–35 indicating a young workforce.

On Item three, 31 (46.3%) of respondents are from the Supply Chain department, 28 (41.8%) are from the Logistics department, 4 (6.0%) are from the IT department, 3 (4.5%) are from Other departments, and 1 (1.5%) is from Operations. This shows that the majority 31 (46.3%) of respondents are from the Supply Chain department. Notably, Supply Chain and Logistics together account for 88.1% of the total sample, which means that this enhances the validity and relevance of the findings of this study.

On Item four, 29 (43.3%) of respondents have 0–5 years of work experience, 34 (50.7%) have 6–10 years, none fall in the 11–15 year bracket, and 4 (6.0%) have more than 15 years of experience. This shows that the majority 34 (50.7%) of respondents have between 6–10 years of experience which suggesting that a moderately experienced workforce participated in this study.

4.3 Supply Chain Digitalization Implementation at EABSC (SCOR Framework)

This section presents findings related to the first research objective, which sought to assess the extent of supply chain digitalization implementation at EABSC using the five SCOR framework dimensions: Plan, Source, Make, Deliver, and Return. Respondents rated each item on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Mean scores were interpreted using the following scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High. All five dimensions are consolidated in *Table 4.3* below.

Table 4.3: Supply Chain Digitalization Implementation — SCOR Framework (All Dimensions)

#	Statement	Mean	Std. Dev
A. Digital Planning (SCOR: Plan)			
1	Our organization utilizes Supply Chain Digital Twins to simulate 'what-if' scenarios for risk mitigation.	3.13	1
2	We employ Data Analytics (demand sensing) to transition from historical data to predictive foresight.	3.25	0.98
3	Our Information Systems aggregate data from across the enterprise to support a linked-data information model.	3.19	0.96
4	Digital Communication channels synchronize Sales and Operations Planning (S&OP) in real-time.	3.34	0.95
5	Our digital planning has significantly reduced information asymmetry and the bullwhip effect.	3.1	1.05

#	Statement	Mean	Std. Dev
Grand Mean of Digital Planning		**3.2**	
B. Digital Sourcing (SCOR: Source)			
6	We use Tracking & Identification (e.g., RFID, Blockchain) to ensure provenance and ESG compliance.	3.13	1.07
7	Our procurement process maintains an immutable digital audit trail for raw material verification.	3.04	1.09
8	We utilize Smart Contracts to execute payments automatically upon digital verification of delivery.	3.16	1
9	Digital Communication tools facilitate a 'plug-and-play' supplier ecosystem with seamless data flow.	3.02	1.09
10	We employ automated systems for real-time supplier risk monitoring and tendering processes.	3.25	1.02
Grand Mean of Digital Sourcing		**3.12**	
C. Smart Manufacturing (SCOR: Make)			
11	Factory-floor machinery is fully integrated with our ERP systems via the Industrial Internet of Things (IIoT).	3.41	1.01
12	We apply Data Analytics to machine sensor data to drive Predictive Maintenance schedules.	3.34	1.08
13	Tracking & Identification technologies monitor work-in-progress (WIP) components with granular precision.	3.23	1.06
14	Our machines use Digital Communication protocols to self-adjust based on real-time quality data.	3.19	1.12
15	Production schedules are automatically updated based on real-time quality and supply signals.	3.38	1

#	Statement	Mean	Std. Dev
Grand Mean of Smart Manufacturing		**3.31**	
D. Intelligent Delivery (SCOR: Deliver)			
16	We have achieved Real-Time Transportation Visibility (RTTV) through GPS and IoT-based tracking.	3.52	1.12
17	Data Analytics process location and environmental data to optimize dynamic routing and fleet management.	3.44	1.04
18	Our warehouse utilizes Automation (e.g., Autonomous Mobile Robots) to enhance picking/packing.	2.94	1.24
19	Digital Communication networks ensure inventory movements are updated in the system instantaneously.	3.25	1.09
20	Digital logistics practices have significantly enhanced our order fulfillment accuracy and speed.	3.08	1.03
Grand Mean of Intelligent Delivery		**3.25**	
E. Reverse Logistics (SCOR: Return)			
21	Our Information Systems automatically categorize returns to determine the optimal disposition path.	3.2	1.08
22	We use Digital Product Passports to track product lifecycle and material composition for circularity.	3.05	1.11
23	Digital Communication portals automate the customer interface for returns and claims processing.	3.07	1.11
24	Data Analytics are used to optimize the 'last-mile' of the return journey by consolidating shipments.	3.04	1.01
25	Digitization has reduced the environmental footprint and costs of our recovery processes.	3.08	1.1

#	Statement	Mean	Std. Dev
Grand Mean of Reverse Logistics		**3.09**	
Grand Mean for Supply chain digitalization implementation		**3.20**	

Source: Own SPSS output (2026)

4.3.1 Digital Planning (SCOR: Plan)

As shown in *Table 4.3* Item A, from the total of 67 respondents, the use of digital communication channels to synchronize Sales and Operations Planning (S&OP) in real-time received the highest mean score (M = 3.34, SD = 0.95), followed by the application of data analytics for demand sensing (M = 3.25, SD = 0.98), and the use of enterprise information systems for a linked-data model (M = 3.19, SD = 0.96). The use of Supply Chain Digital Twins for risk mitigation (M = 3.13, SD = 1.00) and the effectiveness of digital planning to reduce bullwhip effect (M = 3.10, SD = 1.05) showed lowest results in this dimension. This means that the majority of responses show a moderate level of digital planning ability at EABSC, with a grand mean of 3.20 (SD = 1.01). This indicates that sophisticated predictive and risk-management tools are underutilized.

4.3.2 Digital Sourcing (SCOR: Source)

On Item B, the use of automated systems for real-time supplier risk monitoring and tendering received the highest score (M = 3.25, SD = 1.02), followed by the use of smart contracts for automated payments (M = 3.16, SD = 1.00), tracking and identification technologies such as RFID and Blockchain for provenance and ESG compliance (M = 3.13, SD = 1.07), and the maintenance of immutable digital audit trails (M = 3.04, SD = 1.09). The creation of a 'plug-and-play' supplier ecosystem via digital communication tools received the lowest score (M = 3.02, SD = 1.09). This implies that digital sourcing has the lowest grand mean among all five SCOR dimensions (M = 3.12, SD = 1.03), still within the moderate range, indicating that seamless supplier integration is the least developed aspect of digital sourcing at EABSC.

4.3.3 Smart Manufacturing (SCOR: Make)

On Item C, ERP-IIoT integration on the factory floor received the highest mean score (M = 3.41, SD = 1.01), followed by automatic updating of production schedules based on real-time supply and quality signals (M = 3.38, SD = 1.00), and predictive maintenance driven by data analytics (M = 3.34, SD = 1.08). The use of tracking and identification for granular WIP monitoring (M = 3.23, SD = 1.06) and real-time self-adjusting machine communication protocols (M = 3.19, SD = 1.12) scored slightly lower. This implies that smart manufacturing recorded the second highest grand mean among all SCOR dimensions (M = 3.31, SD = 1.07), indicating a moderate-to-emerging high level of digitalization in production processes, though integration of smart technologies remains uneven across different production units.

4.3.4 Intelligent Delivery (SCOR: Deliver)

On Item D, Real-Time Transportation Visibility (RTTV) through GPS and IoT tracking received the highest score (M = 3.52, SD = 1.12) — the highest individual item score across all 25 SCOR items — followed by data analytics for dynamic routing and fleet management optimization (M = 3.44, SD = 1.04), digital communication for instantaneous inventory updates (M = 3.25, SD = 1.09), and overall order fulfillment improvement through digital logistics (M = 3.08, SD = 1.03). The use of autonomous mobile robots (AMRs) in warehouse operations received the lowest score across all SCOR dimensions (M = 2.94, SD = 1.24). This implies that intelligent delivery achieved a moderate grand mean of 3.25 (SD = 1.03), with EABSC showing clear priority toward outbound logistics visibility while physical warehouse automation remains nascent.

4.3.5 Reverse Logistics (SCOR: Return)

On Item E, the highest rates variable is the use of information systems to automatically categorize returns (M = 3.20, SD = 1.08), next is the reduction in environmental footprint and costs through digitization (M = 3.08, SD = 1.10) and also digital communication portals for returns processing (M = 3.07, SD = 1.11). The lowest scoring variable was the deployment of Digital Product Passports for lifecycle tracking and circularity (M = 3.05, SD = 1.11) along with the use of data analytics to optimize return shipment consolidation (M = 3.04, SD = 1.01). This means that reverse logistics recorded the second lowest grand mean among all five SCOR dimensions (M = 3.09, SD = 1.03). This shows a common organizational tendency to prioritize forward supply chain processes over returns management.

4.3.6 Overall Supply Chain Digitalization Implementation

Smart Manufacturing is the highest among the five dimensions (M = 3.31), then followed by Intelligent Delivery (M = 3.25), Digital Planning (M = 3.20), Digital Sourcing (M = 3.12), and Reverse Logistics (M = 3.09). This means the overall grand mean for supply chain digitalization implementation across the five SCOR dimensions is 3.20 (SD = 0.47), indicating a moderate level of digitalization at EABSC. The suggests that while EABSC has made more progress in production-level digitalization and outbound logistics visibility, procurement and returns management digitalization are behind. It shows that EABSC has initiated supply chain integration but not yet fully achieved it.

4.4 Logistics Performance of EABSC

This section presents descriptive findings on the logistics performance of EABSC, measured across five dimensions: Order Cycle Time, Inventory Turnover, Stock-Out Rate, Transportation Cost Efficiency, and Order Fulfillment Rate. The results are consolidated in *Table 4.4* below.

Table 4.4: Logistics Performance — Descriptive Statistics

Logistics Performance Indicators	Mean	Std. Dev
A. Order Cycle Time		
Orders are processed within a short time	3.49	1.08
Order processing is efficient	3.13	1.04
Customers receive orders quickly	3.01	1.09
Grand Mean of Order Cycle Time	**3.21**	
B. Inventory Turnover		
Inventory is replenished efficiently	3.1	1.12

Logistics Performance Indicators	Mean	Std. Dev
Inventory moves quickly within the system	3.17	1.06
Overstocking is minimized	3.23	1.1
Grand Mean of Inventory Turnover	**3.17**	
C. Stock-Out Rate		
Stock-out situations are rare	3.11	1.02
Products are usually available when needed	3.11	1.11
Inventory shortages are well managed	3.35	1.03
Grand Mean of Stock-Out Rate	**3.19**	
D. Transportation Cost Efficiency		
Transportation costs are well controlled	3.32	1
Logistics operations minimize transportation expenses	3.28	1.03
Resources are used efficiently in transportation	3.14	1.12
Grand Mean of Transportation Cost Efficency	**3.25**	
E. Order Fulfillment Rate		
Orders are fulfilled accurately	3.34	0.83
Customer orders are completed successfully	3.26	0.85
The company meets order requirements consistently	3.2	0.85
Grand Mean of Order Fulfillment Rate	**3.27**	

Logistics Performance Indicators	Mean	Std. Dev
Grand Mean of Logistics Performance	**3.22**	

Source: Own SPSS output (2026)

4.4.1 Order Cycle Time

As shown on *Table 4.4* Item A, from the total of 67 respondents, the timeliness of order processing received the highest mean score (M = 3.49, SD = 1.08), followed by order processing efficiency (M = 3.13, SD = 1.04), and customer order receipt speed (M = 3.01, SD = 1.09) was rated lowest within this dimension. This shows that the grand mean for order cycle time is 3.21 (SD = 0.80), implying that the majority of respondents rated order cycle time at a moderate level, with initial order processing being relatively swift while end-to-end speed from receipt to customer delivery requires improvement.

4.4.2 Inventory Turnover

On Item B, minimization of overstocking showed the highest rating (M = 3.23, SD = 1.10), and inventory replenishment efficiency rated lowest (M = 3.10, SD = 1.12). This also shows that the grand mean for inventory turnover is 3.17 (SD = 0.89), suggesting the majority of respondents rated inventory turnover in a moderate level, saying that while EABSC handles overstocking well, the speed and efficiency of inventory replenishment and movement could be improved through better digital integration.

4.4.3 Stock-Out Rate

On Item C, highest rated variable is inventory shortage management (M = 3.35, SD = 1.03), while product availability and rarity of stock-outs both scored 3.11. This means that the grand mean for stock-out rate is 3.19 (SD = 0.83), saying that the majority of respondents rated stock-out rate at a moderate level, suggesting that while EABSC has established certain measures to control stockout it still has not achieved the level of responsiveness that advanced demand forecasting and real-time inventory visibility systems would have.

4.4.4 Transportation Cost Efficiency

On Item D, cost control of transportation operations was rated highest (M = 3.32, SD = 1.00), followed by the minimization of logistics expenses (M = 3.28, SD = 1.03), while the efficient use of transportation resources scored lowest at 3.14. This shows that the grand mean for transportation cost efficiency is 3.25 (SD = 0.82), implying that the majority of respondents rated transportation cost efficiency at a moderate level and that it is the highest-performing dimension, suggesting that EABSC exercises reasonable cost management in transportation while there remains scope for greater efficiency through route optimization and fleet analytics.

4.4.5 Order Fulfillment Rate

On Item E, the highest rated variable is order fulfillment accuracy (M = 3.34, SD = 0.83), succeeded by successful order completion (M = 3.26, SD = 0.85), and a consistent meeting of order requirements scored lowest (M = 3.20, SD = 0.85). Showing that the grand mean for order fulfillment rate is 3.27 (SD = 0.61) means that order fulfillment is the most performing dimension, with respondents rating it moderately and consistently across departments.

4.4.6 Overall Logistics Performance

The highest performing was Order Fulfillment Rate performed best (M = 3.27), followed by Transportation Cost Efficiency (M = 3.25), Order Cycle Time (M = 3.21), Stock-Out Rate (M = 3.19), and Inventory Turnover (M = 3.17). This indicates that the grand mean for logistics performance 3.22 (SD = 0.65) is the highest suggesting that most of the respondents rated logistics performance at a moderate level. Indicating that EABSC maintains functional logistics operations but still has room for improvement and see its full improvement by leveraging digital tools.

4.5 Influence of Supply Chain Digitalization on Logistics Performance

This section addresses the second research objective, examining the statistical influence of supply chain digitalization operationalized through the five SCOR dimensions on logistics performance. Pearson correlation analysis and multiple linear regression were employed.

4.5.1 Pearson Correlation Analysis

Table 4.5 presents the Pearson correlation matrix for the five supply chain digitalization dimensions and logistics performance.

Table 4.5: Pearson Correlation Matrix

Variable	Digital Planning	Digital Sourcing	Smart Manufacturing	Intelligent Delivery	Reverse Logistics	Logistics Performance
Digital Planning	1					
Digital Sourcing	0.568**	1				
Smart Manufacturing	0.390**	0.547**	1			
Intelligent Delivery	0.133	0.240	0.436**	1		
Reverse Logistics	0.264*	0.506**	0.490**	0.483**	1	
Logistics Performance	0.187	-0.079	0.212	0.195	-0.173	1

*Note: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).*
Source: Own SPSS output (2026)

The above correlation matrix in *Table 4.5* shows a significant inter-correlations among several SCOR dimensions in the adoption of different digitalization practices. Digital Planning and Digital Sourcing show the strongest inter-dimension correlation ($r = 0.568$, $p < 0.01$), suggesting that organizations that plan digitally tend to also procure digitally. Digital Sourcing and Smart Manufacturing are also significantly correlated ($r = 0.547$, $p < 0.01$), also Smart Manufacturing and Reverse Logistics ($r = 0.490$, $p < 0.01$). Intelligent Delivery shows significant correlation only with Smart Manufacturing ($r = 0.436$, $p < 0.01$) and Reverse Logistics ($r = 0.483$, $p < 0.01$), indicating that it functions slightly independently of the upstream SCOR processes in this context.

In regards to logistics performance, some of the dimensions don't show a statistically significant bivariate correlation individually. Digital Planning ($r = 0.187$), Smart Manufacturing ($r = 0.212$), and Intelligent

Delivery (r = 0.195) show small positive correlations, while Digital Sourcing (r = -0.079) and Reverse Logistics (r = -0.173) show a negative relationships. This is in line with Gunasekaran et al. (2017), who stated that individual digital investments may not result in a statistically significant bivariate effects on performance unless it is considered together, and with Kettinger et al. (1997), who emphasizes the multivariate nature of technology's influence on organizational results. Pappas et al. (2018) also argues that the impact of digitalization on performance is better understood through multivariate analysis, which is further examined in the regression section below.

4.5.2 Regression Analysis

4.5.2.1 Model Summary

Table 4.6 presents the summary of the multiple linear regression model predicting logistics performance from the five SCOR digitalization dimensions.

Table 4.6: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.520[a]	.271	.211	.57975

a. Predictors: (Constant), ReverseLogistics_Mean, DigitalPlanning_Mean, IntelligentDelivery_Mean, SmartManufacturing_Mean, DigitalSourcing_Mean

Source: Own SPSS output (2026)

As shown in *Table 4.6* above the regression model showed an R value of 0.520, suggesting a moderate positive relationship between the consollidated set of supply chain digitalization predictors and logistics performance. The R Square value of 0.271 suggests that 27.1% of the variance in logistics performance is explained by the five SCOR digitalization dimensions together. When adjusting for the number of predictors and sample size, the Adjusted R Square is 0.211, still represents a meaningful level explanatory contribution. The standard error of the estimate is 0.57975.

4.5.2.2 ANOVA Results

Table 4.7 presents the ANOVA results testing the overall significance of the regression model.

Table 4.7: ANOVA Results

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.618	5	1.524	4.533	.001[b]
	Residual	20.502	61	.336		
	Total	28.120	66			
a. Dependent Variable: LogisticsPerformance						
b. Predictors: (Constant), ReverseLogistics_Mean, DigitalPlanning_Mean, IntelligentDelivery_Mean, SmartManufacturing_Mean, DigitalSourcing_Mean						

Source: Own SPSS output (2026)

The ANOVA results above in *Table 4.7* results confirm that the regression model is statistically significant ($F(5, 61) = 4.533$, $p = 0.001$). Suggesting that the five digitalization dimensions, all together serve as a statistically significant predictor of logistics performance at EABSC, justifying a further examination of individual predictor coefficients.

4.5.2.3 Regression Coefficients

Table 4.8 presents the unstandardized and standardized regression coefficients for each predictor.

Table 4.8: Regression Coefficients

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.

1	(Constant)	2.267	.511		4.437	<.001
	DigitalPlanning_Mean	.308	.142	.291	2.171	.034
	DigitalSourcing_Mean	-.298	.160	-.291	-1.866	.067
	SmartManufacturing_Mean	.323	.139	.334	2.323	.024
	IntelligentDelivery_Mean	.283	.135	.273	2.096	.040
	ReverseLogistics_Mean	-.353	.126	-.398	-2.792	.007

*Note: * p < 0.05; ** p < 0.01. Dependent Variable: Logistics Performance.*

Source: Own SPSS output (2026)

The regression coefficients presented above in *Table 4.8* provides a nuanced picture of how each digitalization dimension relates to logistics performance when the others remain constant. Digital Planning ($\beta = 0.291$, $t = 2.171$, $p = 0.034$) has a statistically significant positive effect on logistics performance, suggesting that improvements on digital planning practices like demand sensing, digital twin simulations, and real-time S&OP directly contributes to better logistics results. Smart Manufacturing ($\beta = 0.334$, $t = 2.323$, $p = 0.024$) shows the strongest positive standardized coefficient that indicates that IIoT-enabled production integration, predictive maintenance, and real-time production scheduling are the most powerful drivers of logistics performance among the SCOR dimensions. Intelligent Delivery shows that it positively and significantly can predict logistics performance ($\beta = 0.273$, $t = 2.096$, $p = 0.040$) also, confirmirming that RTTV, dynamic routing, and real-time inventory meaningfully strengthen logistics outcomes.

On the other hand, Digital Sourcing ($\beta = -0.291$, $t = -1.866$, $p = 0.067$) shows a negative coefficient that falls short of statistical significance at the 0.05 level. This result may due to the fact that while procurement activities are carried out at the Addis Ababa EABSC branch, digital sourcing systems are insufficiently integrated into branch-level operational processes. Thus, digital sourcing initiatives could not yet add effectively to logistics activities, which explains the observed negative and statistically insignificant relationship with logistics performance. (Presutti, 2003; Cagliano et al, 2005) have argued, digital sourcing and e-procurement can only deliver measurable value when they are completely integrated in the supply chain workflow, and only partial adoption could undermine performance results. In contrast, reverse

logistics shows a statistically significant negative relationship with logistics performance (B = -0.353, p = 0.007), meaning that challenges in reverse logistics processes could decrease general logistics performance inside EABSC. Based on the significant coefficients, the regression equation can be written as:

$$\text{Logistics Performance} = 2.267 + 0.308(DP) - 0.298(DS) + 0.323(SM) + 0.283(ID) - 0.353(RL)$$

The findings suggest that when most of the dimensions of supply chain digitalization improve logistics performance, reverse logistics may could need improvement to avoid negative operational effects, also digital sourcing does not significantly add to performance according to this study.

4.6 Barriers to Supply Chain Digitalization Implementation at EABSC

This section addresses the third research objective, which attempted to identify the institutional, technological, and organizational barriers hindering supply chain digitalization at EABSC. The findings are summarized in *Table 4.9* below.

Table 4.9: Barriers to Supply Chain Digitalization — Descriptive Statistics

Barriers to Supply Chain Digitalization	Mean	Std. Dev
A. Institutional Barriers		
Lack of policies affects digital implementation	3.5	0.93
There is limited management support for digital systems	2.74	0.93
Organizational structure slows digital adoption	2.62	0.91
Grand Mean of Institutional Barriers	**2.96**	
B. Technological Barriers		

Barriers to Supply Chain Digitalization	Mean	Std. Dev
Systems are not well integrated	3.14	1.04
Technology infrastructure is insufficient	3.05	0.96
System failures affect operations	2.8	1.01
Grand Mean of Supply Chain Digitalization	**3.01**	
C. Organizational Barriers		
Employees lack digital skills	3.35	0.9
Resistance to change exists	3.19	1.04
Training on digital systems is limited	2.5	0.9
Grand Mean of Organizational Barriers	**3.02**	

Source: Own SPSS output (2026)

4.6.1 Institutional Barriers

As shown on *Table 4.9* Item A, from the total of 67 respondents, the lack of supportive policies for digital implementation received the highest mean score (M = 3.50, SD = 0.93), followed by limited management support (M = 2.74, SD = 0.93), and organizational structures that slow digital adoption scored lowest (M = 2.62, SD = 0.91). The grand mean for this dimension is 2.96 (SD = 0.54), showing that not enough digital policy frameworks represent the most important institutional obstacle pointing to the fact that although managerial backing is present, the lack off formal digital policies generates friction that hinders digitalization advancement.

4.6.2 Technological Barriers

On Item B, poor systems integration was shown as the most significant technological barrier (M = 3.14, SD = 1.04), followed by insufficient technology infrastructure (M = 3.05, SD = 0.96), and system failures which affects operations scored at the lowest (M = 2.80, SD = 1.01). Indicating that the grand mean for technological barriers is 3.01 (SD = 1.09), meaning that poor systems integration is the foremost technological challenge, with the wide standard deviation pointing to inconsistent thechnology experiences across departments, and potentally indicating disparities of digital infrastructure within EABSC.

4.6.3 Organizational Barriers

On Item C, the lack of digital skills among the employees was the most significant barrier (M = 3.35, SD = 0.90), this was followed by resistance to change (M = 3.19, SD = 1.04), and limited training provision which scored lowest (M = 2.50, SD = 0.90). This shows that the grand mean for organizational barriers is 3.02 (SD = 0.63), suggesting that digital skills gap is the highest organizational constraint, with resistance to change deepening the challenge.

4.6.4 Summary of Barriers

On Item D, across the three barrier categories, the lack of supportive policy frameworks (M = 3.50) and insufficient digital skills (M = 3.35) stand out as the highest constraints, followed by resistance to change (M = 3.19) and technological integration gaps (M = 3.14) adding to the challenge, while limited managerial support and insufficient training remain secondary yet notable concerns. This suggests that achieving full supply chain digitalization at EABSC will require actions across their policy, skills, technology, and change management fronts.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The general objective of this research was to examine the effect of supply chain digitalization on the logistics performance of East Africa Bottling Share Company (EABSC), guided by three specific objectives: assessing the extent of digitalization implementation using the SCOR framework; examining its influence on logistics performance; and identifying the barriers hindering its implementation. A structured questionnaire was distributed to 101 employees, of whom 67 responded, yielding a response rate of 66.3%. Data were analyzed through descriptive statistics, Pearson correlation, and multiple linear regression. The findings corresponding to each objective are summarized as follows.

The finding that EABSC has initiated but not yet achieved full operational maturity in supply chain digitalization, with an overall grand mean of 3.20, is consistent with the Technology Organization Environment (TOE) framework (Tornatzky & Fleischer, 1990). The uneven distribution of digitalization across the five SCOR dimensions reflects the simultaneous influence of technological, organizational, and environmental contexts on adoption. Smart Manufacturing (M = 3.31) and Intelligent Delivery (M = 3.25) recorded the highest means, indicating that where digital tools such as ERP-IIoT integration, GPS, and real-time scheduling are well configured, the technological context enables faster advancement. By contrast, Digital Sourcing (M = 3.12) and Reverse Logistics (M = 3.09) lagged behind, consistent with the TOE prediction that insufficient system integration and infrastructure constrain implementation in those areas. The organizational context of the TOE framework is also reflected in the finding that organizational barriers were the most prominent (M = 3.02), led by the digital skills gap and resistance to change, which correspond directly to the employee skills and management support dimensions that TOE identifies as internal determinants of technology adoption. The environmental context is captured in the institutional barriers finding (M = 2.96), particularly the absence of supportive policy frameworks, which scored the highest of any individual barrier item. This confirms that external regulatory and institutional conditions

are shaping the pace of digitalization at EABSC, in line with TOE's argument that environmental factors such as government regulations and industry trends play a meaningful role in technology implementation.

Regarding the influence on logistics performance and the Resource-Based View, the finding that the five SCOR dimensions collectively explained 27.1% of the variance in logistics performance, with Smart Manufacturing as the strongest positive predictor, is consistent with the Resource-Based View (Barney, 1991). RBV argues that firms attain competitive advantage by efficiently deploying valuable, rare, inimitable, and non-substitutable digital resources, and the regression results support this logic. Smart Manufacturing, driven by ERP-IIoT integration and real-time production scheduling, represents a deeply embedded and firm-specific digital capability that, when effectively deployed, drives superior outcomes across Order Cycle Time, Inventory Turnover, and Order Fulfillment Rate. Digital Planning and Intelligent Delivery similarly emerged as significant positive predictors, consistent with the RBV argument that strategically deployed digital resources translate into enhanced logistics performance. The fact that the model explained 27.1% of the variance, rather than a higher proportion, is also theoretically coherent with RBV, since digital capabilities are one source of performance advantage alongside other resource dimensions such as human capital, physical assets, and organizational routines. The negative effect of Reverse Logistics on logistics performance is further interpretable through RBV: early-stage digital resources that have not yet achieved operational maturity do not meet the VRIN criteria and may generate transitional disruptions rather than performance gains, consistent with the finding that Reverse Logistics reflects early-stage implementation challenges.

Furthermore, the SCOR framework interdependencies and Supply Chain Integration Theory, the finding that strong inter-correlations exist among the five SCOR dimensions, most notably between Digital Planning and Digital Sourcing and between Digital Sourcing and Smart Manufacturing, is consistent with Supply Chain Integration Theory (Mentzer et al., 2001). Supply Chain Integration Theory emphasizes that effective coordination across internal processes and external supply chain relationships amplifies operational performance, and the correlation results confirm that the SCOR dimensions at EABSC function as an integrated digital system rather than isolated functional units. The finding that piecemeal digitalization efforts are unlikely to yield maximum returns is a direct empirical validation of the theory's core proposition, which holds that the performance benefits of digitalization are amplified when

dimensions are connected and mutually reinforcing. Furthermore, the moderate logistics performance levels across all five indicators (overall M = 3.22) are partly explained by the incomplete integration of the system, particularly the weak operational linkages in Digital Sourcing and Reverse Logistics, which integration theory would predict as systemic bottlenecks that constrain overall logistics performance even where individual dimensions such as Smart Manufacturing are relatively advanced.

Moreover, the barriers and the broader theoretical implications, the finding that EABSC faces a complex, multi-dimensional barrier environment spanning organizational, technological, and institutional fronts further reinforces the explanatory power of the TOE framework and its alignment with the SCOR-based digitalization journey documented in this study. The barriers do not operate in isolation: the digital skills gap weakens organizational capacity to leverage technological investments, poor system integration limits the inter-dimensional connectivity that Supply Chain Integration Theory identifies as essential, and the absence of supportive policy frameworks reduces the environmental conditions under which VRIN digital resources can be built and sustained. Together, these findings confirm that supply chain digitalization at EABSC is a theoretically complex, multi-layered phenomenon, and that its full performance potential can only be realized when technological, organizational, and environmental enablers are simultaneously addressed across all SCOR dimensions.

5.2 Conclusions

Regarding the extent of digitalization, EABSC has started its digitalization journey but has not yet reached full maturity, with an overall grand mean of 3.20 out of 5.00. Smart Manufacturing was the most advanced dimension, while Reverse Logistics was the least developed, showing that EABSC's efforts are more concentrated in production and delivery than in procurement and returns management. This uneven pattern is explained by the TOE framework (Tornatzky & Fleischer, 1990), which states that technology adoption is shaped by technological, organizational, and environmental readiness, and where these are not equally developed, digitalization advances unevenly. Moreover, logistics performance, the five SCOR dimensions together explained 27.1% of the variance in logistics outcomes, with Smart Manufacturing as the strongest driver. Digital Planning and Intelligent Delivery also contributed positively, while Digital Sourcing

showed no significant effect due to poor workflow integration, and Reverse Logistics showed a negative effect from early-stage implementation disruptions. These results are consistent with the Resource-Based View (Barney, 1991), which argues that digital technologies only generate performance gains when they are fully embedded in operational practice. In addition, SCOR interdependencies, the five dimensions function as a connected system rather than independent initiatives, supporting Supply Chain Integration Theory (Mentzer et al., 2001). The strong correlations between dimensions confirm that piecemeal digitalization will not generate maximum returns, and a holistic approach across all five dimensions is necessary. Furthermore, barriers, EABSC faces organizational, technological, and institutional challenges that correspond directly to the three contexts of the TOE framework. The digital skills gap, poor system integration, and the absence of supportive policy frameworks are the most critical obstacles. Addressing these barriers in a coordinated manner is the main requirement for EABSC to advance from moderate to full supply chain digitalization.

5.3 Recommendations

Based on the findings and conclusions of this study, the following recommendations are offered for the consideration of EABSC and relevant stakeholders:

- **A Comprehensive Supply Chain Digitalization Roadmap Would Be Worth Exploring:** Given the overall grand mean of 3.20, it appears that EABSC has taken encouraging first steps, though there remains meaningful room to grow across all five SCOR dimensions. It would be beneficial if the company could work toward a shared roadmap that outlines realistic milestones, distributes responsibilities across departments, and guides investment across Plan, Source, Make, Deliver, and Return in a phased and sustainable way. Ideally, such a document would be revisited regularly at the leadership level so that moderate progress does not quietly become the ceiling.
- **Further Attention to Smart Manufacturing, Digital Planning, and Intelligent Delivery Could Yield Strong Returns:** These three dimensions showed the clearest positive relationship with logistics performance, and it would be worthwhile for EABSC to continue building on them. Expanding the use of IIoT-enabled production systems, demand forecasting tools connected to ERP platforms, and GPS-based fleet tracking would likely strengthen results. Warehouse

automation deserves particular attention, as autonomous mobile robot deployment scored lowest across all 25 SCOR items, suggesting this is one area where even modest investment could make a visible difference.

- **Digital Sourcing Integration May Benefit from a Closer Look:** The findings suggest that digital sourcing has not yet translated into measurable performance gains, possibly because it has not been deeply embedded into branch-level operations. It would be helpful if EABSC could review how well its e-procurement platforms connect with existing ERP systems, and consider whether supplier portals, automated tendering, or blockchain-based provenance tracking might help bridge those gaps over time.
- **Reverse Logistics Systems Would Benefit from Thoughtful Redesign:** The relationship between reverse logistics and logistics performance was notably concerning in this study, and it is an area that perhaps warrants the most urgent reflection. A process review to identify where bottlenecks, integration challenges, and adoption difficulties are occurring would be a reasonable starting point. Learning from how comparable beverage and FMCG companies in the East African region have approached similar challenges could also offer useful direction.
- **Building Digital Skills and Strengthening Leadership Buy-In Seems Especially Important in the Ethiopian Context:** The digital skills gap among employees stood out as the most prominent organizational barrier, and this is not surprising given the broader challenges of digital transition in developing economies. Structured and practical training programs across supply chain and logistics functions would go a long way. It would also be valuable if senior leadership could approach digitalization not as a one-time project but as an ongoing organizational commitment, supported by honest performance data and continued learning at the top.
- **ICT Infrastructure Investment, Including Scalable and Affordable Options, Is Worth Considering:** Weak system integration and limited technology infrastructure were identified as significant technological barriers. Where large-scale in-house investment may not be immediately feasible, cloud-based solutions and public-private technology partnerships within the Ethiopian market offer realistic and lower-cost pathways that could meaningfully improve connectivity and integration across operational sites.
- **Engaging Policymakers Could Help Create a More Enabling Environment:** The absence of supportive policy frameworks scored highest among all barrier items, reflecting a challenge that is

wider than any single company. It would be worthwhile for EABSC's leadership to engage with relevant government ministries, regulatory bodies, and industry associations to share their experience and contribute to conversations around electronic commerce, digital procurement, data protection, and digital payment systems. In a context like Ethiopia, where the regulatory environment is still evolving, such engagement can be genuinely impactful.

- **Embedding a Culture of Data-Driven Performance Monitoring Would Support Long-Term Progress:** Finally, it is suggested that EABSC consider building regular logistics performance monitoring into its operations through digital dashboards and accessible analytics tools. Routine reviews anchored to the five key performance indicators identified in this study would help management track whether digitalization efforts are delivering results and where adjustments might be needed, gradually building a culture where decisions are informed by evidence rather than assumption.

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APPENDIX I

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

MA LOGISTICS AND SUPPLY CHAIN MANAGEMENT QUESTIONNAIRE

My name is Dania Abdulmalik, and I am a Master's student in Logistics and Supply Chain Management at Addis Ababa University, School of Commerce. The purpose of this questionnaire is to collect data for a study entitled "The Effect of Supply Chain Digitalization on the Logistics Performance of East Africa Bottling Share Company." This questionnaire is designed to gather relevant information from respondents in order to support the achievement of the research objectives. Your participation in this study is entirely voluntary, and you are kindly requested to complete the questionnaire honestly and carefully, as your responses are important for the validity and reliability of the study findings. The researcher would like to declare that the data collected through this questionnaire will be used **strictly for academic research purposes only**. All responses will be treated with **confidentiality and anonymity**, and no personal identifiers will be disclosed. Therefore, you are kindly requested to respond to each item accurately and attentively.

Thank you for your cooperation

Yours Sincerely,

Dania Abdulmalik

daniaabdulmalik662@gmail.com

Telephone: +251 93 220 4626

Advisor: Shiferaw Mitiku (PhD)

Note:

No need of writing your name Please

fill the answer by putting «√»

Kindly provide your response alternatively and return the completed questionnaire as soon as possible,

Part I: Back ground information of the respondent;

NO	**ITEMS**	OPTIONS	PUT(√)
1	**Gender:**	☐Male	
		☐Female	
2	**Age:**	☐18-25	
		☐26-35	
		☐36-45	
		☐Above 45	
3	**Department:**	☐Logistics	
		☐Supply Chain	
		☐Operations	
		☐IT	
		☐Other	
4	**Years of experience:**	☐ 0-5	
		☐6-10	
		☐11-15	
		☐Above 15	

INSTRUCTION: This section is designed to assess the extent to which supply chain digitalization practices are implemented at East Africa Bottling Share Company (EABSC). The statements below relate to different aspects of digitalization in supply chain and logistics activities, including information sharing, inventory management, and transportation and distribution systems.

Please tick (√) the box that best represents your level of agreement using the following scale:

Survey Questionnaire: Supply Chain Digitization (SCD) Practices

Please rate the following statements based on your organization's current operations:

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

No.	**Questionnaire Item (Statement)**	**Scale**				
A	**Digital Planning**	**1**	**2**	**3**	**4**	**5**
1	Our organization utilizes Supply Chain Digital Twins to simulate "what-if" scenarios for risk mitigation.					
2	We employ Data Analytics (demand sensing) to transition from historical data to predictive foresight.					
3	Our Information Systems aggregate data from across the enterprise to support a linked-data information model.					
4	Digital Communication channels synchronize Sales and Operations Planning (S&OP) in real-time.					
5	Our digital planning has significantly reduced information asymmetry and the bullwhip effect.					
B	**Digital Sourcing**	**1**	**2**	**3**	**4**	**5**
6	We use Tracking & Identification (e.g., RFID, Blockchain) to ensure provenance and ESG compliance.					
7	Our procurement process maintains an immutable digital audit trail for raw material verification.					

8	We utilize Smart Contracts to execute payments automatically upon digital verification of delivery.					
9	Digital Communication tools facilitate a "plug-and-play" supplier ecosystem with seamless data flow.					
10	We employ automated systems for real-time supplier risk monitoring and tendering processes.					
C	**Smart Manufacturing**	**1**	**2**	**3**	**4**	**5**
11	Factory-floor machinery is fully integrated with our ERP systems via the Industrial Internet of Things (IIoT).					
12	We apply Data Analytics to machine sensor data to drive Predictive Maintenance schedules.					
13	Tracking & Identification technologies monitor work-in-progress (WIP) components with granular precision.					
14	Our machines use Digital Communication protocols to self-adjust based on real-time quality data.					
15	Production schedules are automatically updated based on real-time quality and supply signals.					
D	**Intelligent Delivery**	**1**	**2**	**3**	**4**	**5**
16	We have achieved Real-Time Transportation Visibility (RTTV) through GPS and IoT-based tracking.					
17	Data Analytics process location and environmental data to optimize dynamic routing and fleet management.					
18	Our warehouse utilizes Automation (e.g., Autonomous Mobile Robots) to enhance picking/packing.					
19	Digital Communication networks ensure inventory movements are updated in the system instantaneously.					
20	Digital logistics practices have significantly enhanced our order fulfillment accuracy and speed.					
E	**Reverse Logistics**	**1**	**2**	**3**	**4**	**5**
21	Our Information Systems automatically categorize returns to determine the optimal disposition path.					
22	We use Digital Product Passports to track product lifecycle and material composition for circularity.					
23	Digital Communication portals automate the customer interface for returns and claims processing.					

24	Data Analytics are used to optimize the "last-mile" of the return journey by consolidating shipments.					
25	Digitization has reduced the environmental footprint and costs of our recovery processes.					

PART III: QUESTIONS REGARDING LOGISTICS PERFORMANCE

Please rate the following statements based on your organization's current operations: *1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree*

No.	**Questionnaire Item (Statement)**	**Scale**				
A	**Order Cycle Time**	**1**	**2**	**3**	**4**	**5**
1.	Orders are processed within a short time					
2.	Order processing is efficient					
3.	Customers receive orders quickly					
B	**Inventory Turnover**	**1**	**2**	**3**	**4**	**5**
4.	Inventory is replenished efficiently					
5.	Inventory moves quickly within the system					
6.	Overstocking is minimized					
C	**Stock out Rate**	**1**	**2**	**3**	**4**	**5**
7.	Stock-out situations are rare					
8.	Products are usually available when needed					
9.	Inventory shortages are well managed					
D	**Transportation Cost Efficiency**	**1**	**2**	**3**	**4**	**5**
10.	Transportation costs are well controlled					
11.	Logistics operations minimize transportation expenses					
12.	Resources are used efficiently in transportation					
E	**Order Fulfillment Rate**	**1**	**2**	**3**	**4**	**5**
13.	Orders are fulfilled accurately					
14.	Customer orders are completed successfully					

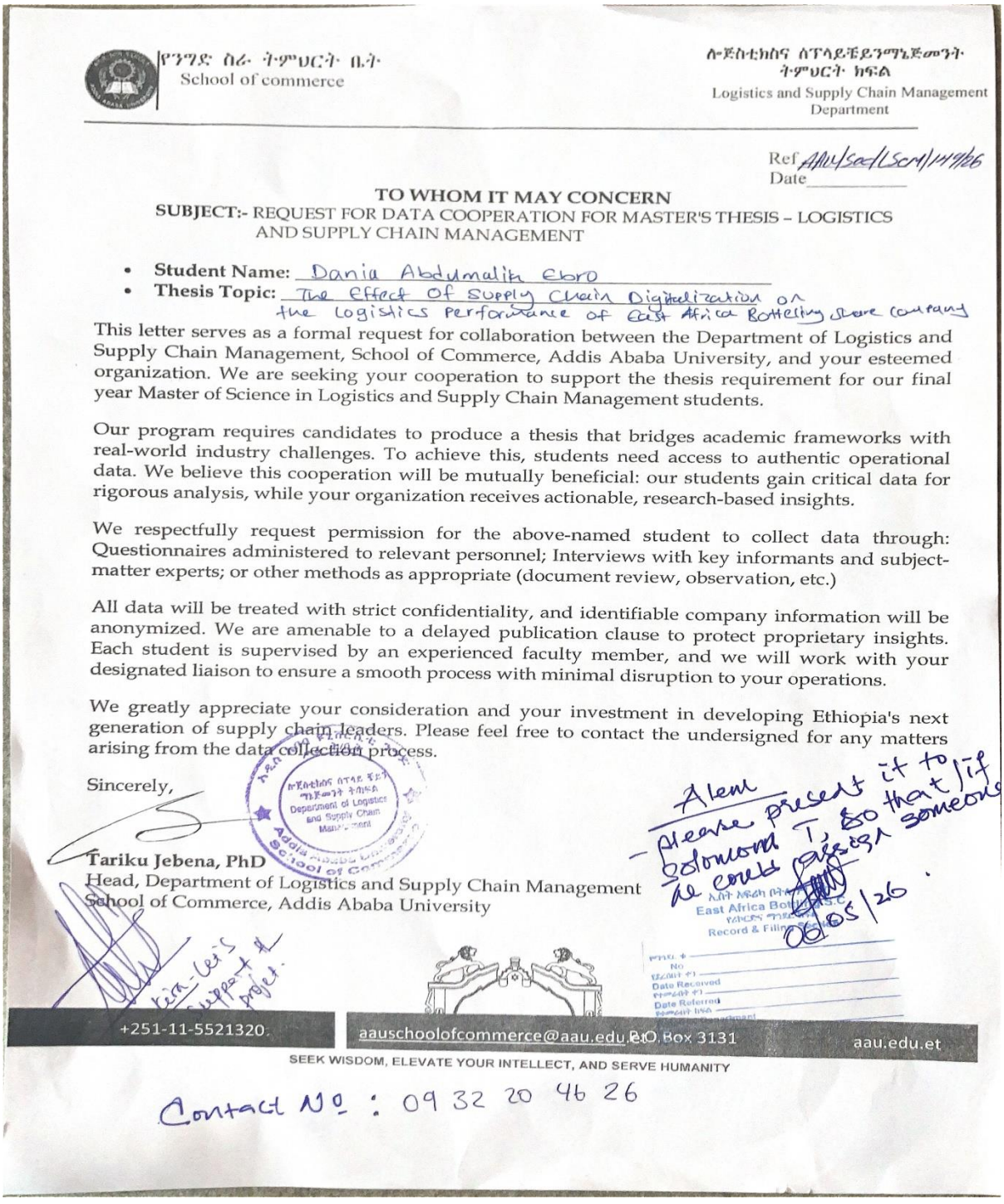
15.	The company meets order requirements consistently					

PART **IV:** QUESTIONS REGARDING INSTITUATIONAL, TECHNOLOGICAL, AND ORGANIZATIONAL CHALLENGES

Please rate the following statements based on your organization's current operations: *1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree*

No.	**Questionnaire Item (Statement)**	**Scale**				
A	**Institutional Challenges**	**1**	**2**	**3**	**4**	**5**
1.	Lack of policies affects digital implementation					
2.	There is limited management support for digital systems					
3.	Organizational structure slows digital adoption					
B	**Technological Challenges**	**1**	**2**	**3**	**4**	**5**
4.	Systems are not well integrated					
5.	Technology infrastructure is insufficient					
6.	System failures affect operations					
C	**Organizational Challenges**	**1**	**2**	**3**	**4**	**5**
7.	Employees lack digital skills					
8.	Resistance to change exists					
9.	Training on digital systems is limited					

ANNEX



የንግድ ስራ ትምህርት ቤት
School of commerce

ሎጅስቲክስና ሰፕላይቼይንማኔጅመንት ትምህርት ክፍል
Logistics and Supply Chain Management Department

Ref AAU/Sac/LScM/1149/26
Date _____

TO WHOM IT MAY CONCERN

SUBJECT:- REQUEST FOR DATA COOPERATION FOR MASTER'S THESIS – LOGISTICS AND SUPPLY CHAIN MANAGEMENT

- **Student Name:** Dania Abdulmalik Ebro
- **Thesis Topic:** The Effect of Supply Chain Digitalization on the Logistics Performance of East Africa Bottling Share company

This letter serves as a formal request for collaboration between the Department of Logistics and Supply Chain Management, School of Commerce, Addis Ababa University, and your esteemed organization. We are seeking your cooperation to support the thesis requirement for our final year Master of Science in Logistics and Supply Chain Management students.

Our program requires candidates to produce a thesis that bridges academic frameworks with real-world industry challenges. To achieve this, students need access to authentic operational data. We believe this cooperation will be mutually beneficial: our students gain critical data for rigorous analysis, while your organization receives actionable, research-based insights.

We respectfully request permission for the above-named student to collect data through: Questionnaires administered to relevant personnel; Interviews with key informants and subject-matter experts; or other methods as appropriate (document review, observation, etc.)

All data will be treated with strict confidentiality, and identifiable company information will be anonymized. We are amenable to a delayed publication clause to protect proprietary insights. Each student is supervised by an experienced faculty member, and we will work with your designated liaison to ensure a smooth process with minimal disruption to your operations.

We greatly appreciate your consideration and your investment in developing Ethiopia's next generation of supply chain leaders. Please feel free to contact the undersigned for any matters arising from the data collection process.

Sincerely,

ሎጅስቲክስና ሰፕላይ ቼይን ማኔጅመንት ትምህርት Department of Logistics and Supply Chain Management Addis Ababa University School of Commerce

Tariku Jebena, PhD
Head, Department of Logistics and Supply Chain Management
School of Commerce, Addis Ababa University

Alem
- Please present it to Solomon T, so that if we could possibly someone

East Africa Bottling S.C
Record & Filing Section
06/05/26

Kira-Lei's support & project.

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