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DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

THE ROLE OF SUPPLY CHAIN TECHNOLOGY ADOPTION IN ENHANCING SERVICE DELIVERY: THE CASE OF COMMERCIAL BANK OF ETHIOPIA

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Declaration

I, Amanuel Million, announce this research paper entitled “the role of supply chain technology adoption in enhancing service delivery in the case of Commercial Bank of Ethiopia” is my own and original research work that has not been submitted to any other university or institution for the award of any degree or diploma. To this end, I acknowledged all sources of information that I used to produce the study appropriately.

Amanuel Million _____ Signature _____

Date _____

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LIST OF ABBREVIATIONS AND ACRONYMS

ICT: Information and Communication Technology

ERP: Enterprise Resource Planning

CBE: Commercial Bank of Ethiopia

TOE: Technology-Organization-Environment (Framework)

TAM: Technology Acceptance Model

RBV: Resource-Based View

EDI: Electronic Data Interchange

IT: Information Technology

GDP: Gross Domestic Product

SMEs: Small and Medium Enterprises

KPIs: Key Performance Indicators

SPSS: Statistical Package for Social Sciences

AI: Artificial Intelligence

3D: Three-Dimensional

MA: Master of Arts Delivery Mean (composite score)

ICTMEAN: ICT Infrastructure Mean

DTMEAN: Digital Integration Mean

AUTOMEAN: Automation Mean

I**NTERMEAN:** Interoperability Mean

DATMEAN / DATSMEAN: Data Sharing Mean

CHALLMEAN / CHLLMEAN: Challenges Mean

VIF: Variance Inflation Factor

ANOVA: Analysis of Variances Standard Deviation H1–H6 Hypotheses 1 through 6R^2R-Squared (coefficient of determination) αCronbach's

AlphaβBeta: (standardized regression coefficient)

Df: Degrees of Freedom

pp-value: (probability value)

tt-statistic FF-

NSample: Size Frequency count

ABSTRACT

This study explored the impact of supply chain technology adoption on the service delivery at Commercial Bank of Ethiopia (CBE) by analyzing five aspects namely ICT infrastructure, digital integration, automation, interoperability, and information sharing. For purposes of conducting the study, an explanatory research design which involved both qualitative and quantitative methods was used. In order to collect quantitative data, a structured questionnaire was distributed to 193 participants who had been sampled using stratified random sampling methods from four CBE branches located in Addis Ababa. For qualitative data collection, eight branch managers were interviewed using a structured interview method which had been sampled using purposive sampling method. Data analysis was done using descriptive statistics, Pearson correlation and multiple linear regression for quantitative data while qualitative data was subjected to thematic analysis. ICT infrastructure and data sharing were, however, not significant independent variables, but the crucial role they played was validated through high correlation levels. Some of the organizational barriers that proved influential on the results included lack of adequate skills, insufficient budgets, incompatibility between systems, and resistance to change. Considering these results, the research proposes the following recommendations for CBE: prioritization of automation of high volumes of internal processes, resolving interoperability issues between Oracle and T-24 systems, improving digital integration through replacement of older systems, upgrading of ICT infrastructure as a critical component, and digital skills and change management initiatives.

Keywords: Supply Chain Technology Adoption, Service Delivery, Automation, Interoperability, Commercial Bank of Ethiopia

CHAPTER ONE

INTRODUCTION

This chapter touches on topics like how supply chain technology adoption affects service delivery in the banking sector. It specifically looks at key dimensions of supply chain technology adoption including ICT Infrastructure, digital integration, automation and interoperability, and data sharing and how these contribute to better service delivery. The research was conducted at the Commercial Bank of Ethiopia where supply chain-related activities such as procurement, logistics, and internal operation support overall service performance.

1.1 Background of the Study

Adoption of supply chain technology such as Erp, E procurement ,and real time tracking has turnd out to be the most necessary strategic objective in today Fastly changing corporate world (kache &seuring, 2017) every organization all over the world are now spending more money on the digital platform so to improve customer service, assist a systematic plan and remove operational inefficiency (lim & palvia 2019,rajee &hamed 2018).business may speed up communication and activates real-time data exchange and enhance stakeholder collaboration. The digital technologies that are utilized can be used in various areas of operation, including the supply chain. Modern supply chains are becoming more digitalized as they facilitate faster communication, real-time data sharing, and improved coordination among stakeholders (Lim & Palvia, 2019; Rajee & Hamed, 2018). According to Goonatilake (2020), effective supply chain performance helps reduce costs, optimize resources, and enhance service delivery. Ultimately, supply chain performance contributes significantly to achieving operation excellence and delivering superior customer value (Peteraf, 2020; Morris & Wood, 2021).

Moreover, the current business environment is highly competitive, and for companies to stand out from the competition, one of the tools that can be utilized is digital supply chain tools, such as electronic data interchange, automated systems, and integrated information tools that allow companies to reduce errors, minimize delays, shorten lead times, and support better forecasting and decision making. These supply chain tools not only improve the order and delivery process, but also play a significant role in customer service (Levary, 2020; Susanne, 2021).

Even though, there is significant advancement when it comes to technology; however, when it comes to the adoption of these technologies, organizations still encounter challenges. Some of the challenges include a lack of integration, system inefficiencies, skills gaps, organizational culture, and resistance to change (Haber & Carmeli, 2023, as cited in Pazhanimala, 2023). Even though they might not face the same challenges, banks are not an exception to facing unique challenges when it comes to technology adoption.

Based on the research included above, banks, like other industries, face intense competition. By leveraging digital supply chain tools, banks can streamline their operations and improve customer service, thereby distinguishing themselves from competitors. In the context of Ethiopia's banking sector, the Commercial Bank of Ethiopia (CBE) is recognized as one of the largest financial institutions; however, it still faces increasing competition from private banks. Therefore, maintaining competitiveness is crucial, and one potential strategy is the adoption of supply chain technologies. Therefore, this study seeks to examine how the adoption of supply chain technologies can enhance service delivery at CBE. By integrating key insights from the literature with an analysis of CBE's operational practices, this research aims to assess the bank's level of technology utilization, its impact on service improvement, and the challenges that hinder effective implementation.

With over thousands of branches all over the country and leading the market share in deposit mobilization, loan and digital banking, Commercial Bank of Ethiopia (CBE) is the biggest financial institution in the country. CBE manages a wide range of activities that are used for effective asset gathering. The bank has implemented a number of technologies, including IT based workflow systems, asset tracking, centralized resource planning tools and digital procurement systems, which are meant to increase internal efficiency and to manage extensive activities. Despite all this advancement there seems to be different levels of integration, so CBE is an appropriate example for assessing how supply chain technology adoption affects the results of service delivery.

1.2 Statement of the Problem

One of the key drivers of operational efficiency and enhanced service delivery across various industries is the adoption of supply chain technologies across several industries. Various empirical studies highlight that digital supply chain systems improve operational performance by advancing

process speed, accuracy, coordination, and decision-making abilities (Kache & Seuring, 2017; Lim & Palvia, 2019). In organizations that are service-centric, including banks, these improvements play a significant role in timely delivery, reliability and customer-centric services.

On the other hand, it is important to understand that supply chain technology adoption is not a single, uniform, concept; instead, it involves multiple interrelated dimensions that together play a role in influencing service delivery outcomes. In literature, among the most commonly recognized dimensions are ICT infrastructure, digital integration, automation, interoperability and data sharing abilities. All of these dimensions play a distinct role in influencing organizational performance.For example, ICT infrastructure provides the foundation for digital operation by making sure there is system availability, connectivity and reliability. According to Goonatilake (2020), an effective ICT infrastructure considerably enhances service speed and system efficiency. On the other hand, digital integration plays a role in facilitating coordination among various departments and functions, reducing disconnected processes and delayed operations (Rajee & Hamed, 2018). Likewise, automation and interoperability allows systems to function with minimal human intervention and interact seamlessly, thus minimizing errors, enhancing accuracy, and improving overall efficiency (Levary, 2020). Additionally, based on Susanne (2021), effective data sharing enables companies to access real-time information, which assists in improved decision-making, transparency, and responsiveness to customer needs.

While the benefits of ICT infrastructure, digital integration, automation, interoperability and data sharing abilities are well-documented, there are also several studies indicating that companies, specifically in developing countries, encounter significant challenges when it comes to effectively adopting and using these dimensions of supply chain technologies. Some of these challenges are insufficient infrastructure, lack of technical skills, inadequate system integration, and resistance to organizational change (Haber & Carmeli, 2023; Pazhanimala, 2023). Therefore, the expected improvements in service delivery are not always fully realized. Furthermore, existing studies have not adequately studied individual dimensions including ICT infrastructure, digital integration, automation, and data sharing play a role in enhancing service delivery within the banking sector.

It is through the existence of such a gap that the Commercial Bank of Ethiopia was identified as a suitable research setting. The reason for this being that very little empirical work has been done concerning the adoption of supply chain technology, and how it impacts the service delivery of

banks in Ethiopia, as opposed to the ICT adoption process in both manufacturing industries and other financial organizations in Ethiopia, which have been documented widely in various studies (Solomon, 2018; Tesfaye, 2020). In addition, there were contextual factors such as budgetary constraints, skill deficiencies, infrastructure costs, and unreliable connectivity which impeded the process of digital transformation in CBE (current study, qualitative results).

In contrast to supply chain management studies where performance is normally measured through efficiencies, cost savings, and resource utilization (Mukhopadhyay, 2018), this research focuses on service delivery, being the aspect of performance that is more applicable in light of the need for service delivery, considering the fact that service delivery encompasses time-related characteristics such as speed, accuracy, reliability, accessibility, and quality (Parasuraman et al., 1988; Zeithaml et al., 2006).

Therefore, the problem this study aims to address is the lack of clear empirical evidence on the role played by the major dimensions of supply chain technology adoption, particularly, ICT infrastructure, digital integration, automation, interoperability and data sharing on service delivery at the Commercial Bank of Ethiopia, as well as the factors that can potentially affect their effective implementation. Whereas previous studies focused on the implementation of information technology in the supply chain as well as the delivery of services either separately or in specific sectors such as manufacturing and private banking (Solomon, 2018; Tesfaye, 2020), there is no single study that has addressed the effect of the five factors together in terms of service delivery in the Ethiopian public banking industry.

1.3 Research Question

1. How does ICT infrastructure affect service delivery at the Commercial Bank of Ethiopia?
2. What is the effect of digital integration on service delivery at the Commercial Bank of Ethiopia?
3. How does automation influence service delivery at the Commercial Bank of Ethiopia?
4. How does interoperability influence service delivery at the Commercial Bank of Ethiopia?
5. What role does data sharing play in enhancing service delivery at the Commercial Bank of Ethiopia?

6. What are the challenges of adoption of supply chain technologies at the Commercial Bank of Ethiopia?

1.4 Objectives of the Study

1.4.1 General Objective

To examine the effect of supply chain technology adoption on service delivery at the Commercial Bank of Ethiopia.

1.4.2 Specific Objectives

1. To assess the effect of ICT infrastructure on service delivery at the Commercial Bank of Ethiopia.
2. To evaluate the impact of digital integration on service delivery at the Commercial Bank of Ethiopia.
3. To analyze how automation influence service delivery at the Commercial Bank of Ethiopia.
4. To investigate how interoperability influence service delivery at the Commercial Bank of Ethiopia.
5. To examine the role of data sharing in enhancing service delivery at the Commercial Bank of Ethiopia.
6. To identify the major challenges on adoption of supply chain technologies at the Commercial Bank of Ethiopia.

1.5 Significance of the Study

This study's significance lies in its theoretical and practical contribution to the understanding of supply chain technology adoption in enhancing service delivery in the banking sector, specifically in the context of a developing country.

Practically, this study is expected to provide valuable insights for the Commercial Bank of Ethiopia (CBE) as it works on advancing its digital transformation efforts. This study examines the extent of supply chain technologies adoption and its use across the bank's operations, and its findings

will advise decision-makers about existing gaps, implementation challenges, and opportunities for improvement. The study highlights practical methods to enhance technology integration, advance workflow efficiency, improve resource management and overall enhance service delivery for its customers. The results from this study may also support the Ethiopian financial sector and other public institutions' policymakers handling similar challenges in digitalization. Moreover, this study identifies significant factors that influence successful technology adoption and offer recommendations which can streamline technology-based supply chain practices. Additionally, the study is expected to be helpful for other researchers who want to conduct additional research in digital transformation, operational performance, or supply chain technology in the banking sector.

Theoretically, this study will provide knowledge on technology adoption and supply chain performance in enhancing service delivery in service-centric organizations, particularly, banks in developing countries. This research looks at the current understanding of technology adoptions' influence on service delivery outcomes, an area that is believed to have not been extensively studied in Ethiopia.

Overall, this study will play a significant role in minimizing the gap between the theoretical aspect of technology adoption theory and the practical aspect of service delivery improvements, providing significant insights to banking institutions as well as other related service providers, policymakers and researchers.

1.6 Scope of the Study

This study only looks at investigating the role of supply chain technology adoption in enhancing service delivery at the Commercial Bank of Ethiopia. The conceptual scope of this study is limited to examining supply chain technology adoption from five dimensions, particularly ICT infrastructure, digital integration, interoperability, automation and data sharing. This study also focused particularly on specific operational units responsible for supply chain processes that utilize technology, namely, logistics and inventory management.

The geographical scope of the study was the Commercial Bank of Ethiopia's four branches. These four branches are all located in Addis Ababa and the branches are known as Abiy, Addis Ababa, Finfine, and Selassie. The reason for selecting these branches was because they are special branches(above grade four) that have a particular person assigned to handle material flow such as operation managers, and have diverse customer bases including retail, wholesale and government which was relevant to the topic of the research.

Limitation of the Study

Though this study offers insightful empirical information there are some limitations that should be mentioned. Firstly the study geographic scope was limited to only four branch even though those branches were top tire level branches it limits the generalizability of the findings' to CBE broader nationwide branches. Secondly collecting the data was not an easy task some employes weren't cooperative some said they didn't had time specially the non-managerial level employes. Third, the study relied on self-reported employee perceptions, which may be subject to social desirability bias or individual variation in experience. Fourth, the high multicollinearity detected among the independent variables, while addressed through model transparency and the use of Adjusted R^2, remains a limitation on the precision of individual coefficient estimates. Future research should address these limitations through longitudinal designs, expanded geographic samples, and objective operational performance data.

1.7 Definition of Terms

Supply Chain Technology- according to Lee (2014), although there is no common definition for the term, it refers to tools that help manage and increase effectiveness of companies' operational activities by transforming data into knowledge and information.

Technology Adoption- Pazhanimala (2023) defines technology adoption as the process by which organizations identify new suitable technologies, integrate and use those new technologies for their operations, and attain organizational goals.

Digital Transformation- refers to the use of digital technologies to streamline business processes, enhance information flow, and improve overall organizational efficiency (Yang et al., 2018).

Digitization- it involves changing the means in which data is saved, transferred, and handled from traditional to digital using advances in digital technology and it also involves companies incorporating digital tools into operational procedures to boost productivity (Atarashi and Kim, 2020).

Service Delivery - is defined as the ability of an organization to provide services that meet customer expectations in terms of speed, accuracy, reliability, accessibility, and quality (Parasuraman et al., 1988; Zeithaml et al., 2006). In the banking sector, service delivery includes transaction processing time, service availability, customer satisfaction, error reduction, and responsiveness.

1.8 Organization of the Study

The research paper was organized into five chapters. The first chapter served as an introduction and included the background of the study, the statement of the problem, the research questions, the objectives, the significance, and the scope of the study. The second chapter was a literature review, examining concepts and research on supply chain technology adoption and its impact on enhancing service delivery for service-providing companies, as presented in articles, journals, and books. The third chapter focused on research methodology that highlighted the research approach and design that was used for this study, as well as the sampling techniques and the procedure in which data was collected and analyzed. The fourth chapter was the section in which the results of the study will be presented, and data analysis and interpretation was also included. The fifth and final chapter focused on summary of findings, conclusions, which summarized and provided insights gained from the study, and recommendations was also part of this section.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presents a review of related literature relevant to the study titled "The Role of Supply Chain Technology Adoption in Enhancing Service Delivery: The Case of the Commercial Bank of Ethiopia". The review aims to establish a conceptual and empirical foundation for the study by examining key concepts, relevant theories and models, empirical studies conducted in different contexts, and identified research gaps. The chapter is organized into conceptual review, theoretical review, empirical review, and research gaps.

2.1 Overview of Supply Chain

The concept of supply chain has evolved throughout the years, where initially it was exclusive to military and logistics, and currently has become a tool that is used through various business areas to identify customer value and enhance decision-making (Ballou, 2007; Linton & Handfield, 2017 as cited in Williams, 2020).

Jenkins (n.d.) defines supply chain as network of businesses, individuals, activities, information, and resources utilized in the production and delivery of goods and services from suppliers to consumers.

2.1.1 Supply Chain in the Banking Industry

According to Liu (2014), the service sector is playing a pivotal role in the global economy, where it accounts for approximately 70% of GDP in high-income countries and is rapidly growing in emerging and low-income countries. Therefore, when it comes to supply chain, as much as it is important in the manufacturing sector, it still plays a vital role in the service sector.

The banking industry is part of the service industry, and as much as banks' main focus area is in financial and information flow, they still require material flow that is essential for their everyday operations (Habib & Majumder, 2022). Just like manufacturing institutions, financial institutions such as banks must also manage their supply chain to mitigate and avoid risks related to technology disruptions, regulatory compliance, and third-party providers (Chopra & Meindl, 2019). Moreover, the rise of fintech partnerships in the banking industry has expanded the traditional banking supply chain to switch and adopt more agile and resilient supply chain

strategies (Gai, Qiu, & Sun, 2018). Therefore, effective supply chain management in the banking industry is perceived as a strategic capability that supports service quality and sustainable competitive advantage.

2.2 Supply Chain Performance Metrics

Businesses must make the most of their supply chain resources and capacities to get goods and services to customers as quickly, cheaply, effectively, and efficiently as possible, all while providing customers with the best possible value (Mukhopadhyay, 2018). Supply chain efficiency relies heavily on performance indicators. A company's internal operations can no longer be optimized to the neglect of its vendors' and clients' operations. Supply chain success evaluation is becoming increasingly important, and your business must adapt. There has been a dramatic rise in focus on performance evaluation over the past two decades (Hugos, 2020).

Many businesses now realize that understanding and keeping tabs on their own performance is crucial if they want to succeed in a dynamic market. An important factor in enhancing company results is measurement (Arulrajah and Nawaratne, 2015).

Metrics are used to convey success both internally and to exterior parties. When things are improved, it becomes possible to see where there are discrepancies between actual performance and desired outcomes and to focus development efforts there (Burt, 2016).

Experts in the area of performance assessment concur that there are two main sets of principles that should be followed when designing an evaluation framework. A philosophy management viewpoint, first, can offer some basic guidance on how to approach designing a performance assessment framework. Second, there's a practical perspective that puts an emphasis on the quantifiable characteristics of metrics and KPIs (El-Shamy, 2016).

2.3 Supply Chain Technology

When it comes to the definition of supply chain technology, there is no set definition, and several researchers have defined it based on the study they have conducted. According to Blankley (2008), supply chain technology was defined as an information technology particularly utilized for managing and supporting the supply chain and its elements. On the other hand, Singh (2003) defined it as an application that is used to convert data into information that can lead to efficient

and effective business operations. Another definition of supply chain technology is “a technology or a system that is used to coordinate and integrate information flow electronically throughout the internal and external supply chain to generate effectiveness and efficiency of business processes" (Kamaruddin and Udin, 2009).

According to Association for Supply Chain Management, “supply chain technology are tools and capabilities that provide support to an organization’s supply chain operations by enabling digital transformation through better management of the flow of goods and materials, real-time operational visibility, increased efficiencies, capability identification, and network performance optimization”.

According to Lee et al. (2014), over the past decade, supply chain technology has continuously evolved, transforming business operations and problem-solving strategies. These advancements play a critical role in supply chain management by creating intelligent connections among people, processes, data and assets. Organizations seek to realize greater benefits by adopting innovative approaches that enhance the efficient use of physical, financial, informational, and human resources (Lee et al., 2014).

By implementing sophisticated supply chain technology, companies are able to benefit from supply chain opportunities and ensure their competitiveness (Lee et al., 2014). Moreover, there are various types of supply chain technologies that companies can utilize depending on their operation. While there are still risks and challenges that come with the usage and implementation of supply chain technology, by selecting and tailoring a supply chain technology that works best with their business operations, they can reap the benefits (Lee et al., 2014).

According to the Association for Supply Chain Management, supply chain technologies are greatly evolving, and in the future, they will be supporting new trends such as digitizing data, facilitation of information-sharing, improving visibility, and much more that will help business attain their objectives more efficiently and effectively.

2.4 Supply Chain Technology Adoption

Technology adoption is a crucial process that affects a company’s capacity to stay inventive and competitive in today’s fast-paced business environment (Bonnin Roca & O’sullivan, 2020). According to Lee et al., 2014, supply chain technology is one of the most widely used adoptions

that steer businesses toward success. As mentioned in the Global Information Technology Report, adoption of supply chain technology would show a favorable impact on both short-term and long-term performance of organizations (as cited in Lee et al., 2014).

According to the Association for Supply Chain Management, for organizations to successfully adopt new technologies that will transform their supply chain, there are some tips they can keep in mind. The first one is for organizations to have a forward-looking strategy, and when selecting supply chain technologies, it is important to look at the various options available and pick the one that is compatible with your organization. It is also important to understand the potential risks that come with adopting new supply chain technologies, so preparing a risk mitigation plan beforehand might be helpful, and also prior to implementing the technology fully, having a test run is recommended (Association for Supply Chain Management, n.d.). One of the challenges companies face when it comes to adopting new supply chain technologies is organizational readiness and potential resistance of employees to change; therefore, properly informing and training employees is essential in addition to hiring new talent (Association for Supply Chain Management, n.d.).

2.5 Technology Adoption Frameworks

For the purpose of this study, three frameworks have been selected and discussed below:

2.5.1 Technology-Organization-Environment Framework

Tornatzky and Fleischer (1990) developed the Technology -Organization-Environment (TOE) framework that suggests that technology adoption and adaptation are influenced by technological, organizational and environmental factors. Technological factors include system compatibility and complexity; organizational factors include management support and organizational readiness; and environmental factors include regulatory requirements and competitive pressure. This framework can be used to analyze technology adoption in CBE.

2.5.2 Technology Acceptance Model

Davis (1989) developed the Technology Acceptance Model (TAM) that explains how users come to accept and use technology. According to TAM, user's attitudes toward technology adoption is determined by perceived usefulness and perceived ease of use. In the context of this study, TAM is relevant in explaining how CBE employee's perceptions influence the effective adoption of supply chain technologies.

2.5.3 Resource-Based View

The Resource-Based View (RBV), described by Barney (1991), argues that organizational resources and capabilities, including technological resources, can provide sustainable competitive advantage. Effective adaptation of supply chain technology enhances service delivery by leveraging internal capabilities such as skilled employees, IT infrastructure, and organizational processes.

2.6 Challenges of Effective Adoption of Supply Chain Technology

In the current digital era, technology adoption is a crucial factor when it comes to determining an organization's success. Organizations encounter particular challenges when adopting new technologies because of things like organizational culture, resistance to change, and legacy systems (Haber & Carmeli, 2023). Organizations looking to fully utilize technology to spur innovation and expansion must comprehend the fundamental causes of these difficulties. For businesses, looking to stay inventive and competitive in the ever-changing business environment, figuring out the best ways to integrate new technologies can be crucial (Pazhanimala, 2023).

According to the Association for Supply Chain Management, when it comes to adopting and implementing supply chain technologies, there are certain challenges or obstacles companies will face. One of those challenges is during the initial adoption phase, where companies will need to evaluate various types of technologies and decide on which one works for them. Additionally, adopting supply chain technology would require a considerable amount of investment.

Even though digital transformation is becoming more and more important, many well-established businesses find it difficult to handle the challenges of adopting new technologies, which causes delays, overspending, and unsuccessful projects (Bonnin Roca & O'sullivan, 2020). The majority of businesses tend to implement technologies based on current market trends without knowing what kind of technology is best for the company or how it might provide long-term advantages (Gomes, 2019).

The Association for Supply Chain Management also indicated that when adopting technologies, it requires an extensive implementation process that requires connecting the technology with the existing systems of the organization. In some cases, an organization might not have employees with the necessary skills; therefore, the organization might be required to either train its existing

employees or hire new employees with the necessary skills, which would require time and financial investment.

An industry expert working for a supply chain technology company, known as CCi, has highlighted that one of the main challenges that companies face when it comes to adoption of supply chain technology is the integration of new technologies with legacy systems, as certain organization have process and systems that are already part of their operation so adding new technologies might be complex (Bollym, 2025). The expert also indicated that data management is another significant challenge, as companies would need to be able to use data for achieving end-to-end supply chain visibility (Bollym, 2025).

Therefore, it is important to note that even with the significant benefits that come with adopting supply chain technologies, it is important to understand there are risks as well as challenges that come with it. Organizations should understand the unique challenges they might face and come up with strategies to overcome them to avoid costly mistakes.

2.7 Supply Chain Technology and Service Delivery

Enhancing performance, accountability, and overall service delivery can be achieved through the implementation of supply chain concepts. This approach optimizes the supply chain, increases responsiveness, and improves organizational profitability. Consequently, many organizations prioritize supply chain practices, recognizing them as essential for achieving operational consistency and sustained profitability (Onundo & Muthini, 2019).

Elgazzar and Elzarka (2017), in their study of supply chain management within Egypt's service sector, concluded that service improvements resulted from effective information dissemination facilitated by information technology, customer relationship management, supplier relationship management and service provision management.

Based on the information above, it can be said the adoption of supply chain technology can not only enhance operational transparency, but also reduce service bottlenecks, and improve customer experience. In a banking institution such as CBE, adopting supply chain technologies can facilitate faster transaction processing, improved service reliability, and enhanced customer trust.

Key Pillars of Supply Chain Technologies

According to the literature review, there are certain key pillars which serve as the bases for adopting technological tools in the supply chain. These pillars are: (1) ICT Infrastructure – the underlying technology tools used to make organizations digital (Goonatilake, 2020); (2) Digital Integration – effective collaboration of information exchange between different functions within organizations (Rajee & Hamed, 2018); (3) Automation – the ability of the system to work without human interference and commit minimal mistakes (Levary, 2020); (4) Interoperability – compatibility of technologies and their platforms (Kache & Seuring, 2017); and (5) Data Sharing – the exchange of information for better decision-making (Susanne, 2021).

Pillars of Service Delivery

There are various aspects considered when analyzing the process of service delivery, especially within the domain of banking. These aspects, according to Parasuraman et al. (1988) and Zeithaml et al. (2006), who have already been quoted in your thesis, are as follows: (1) Speed – speed of transaction processing; (2) Accuracy – minimization of mistakes in service delivery; (3) Reliability – consistency and reliability of services provided; (4) Accessibility – accessibility of services offered; and (5) Quality – quality of services delivered. Incorporation of technologies within the supply chain contributes significantly to all five mentioned pillars of service delivery.

2.8 Digital Transformation Practices

The widespread adoption of digital technologies has resulted in a corresponding upheaval in business practices, known as digital transformation (Levary, 2020). Organizations are becoming more fluid and adaptive as a result of digital change. When faced with the task of digital change and the need to contend successfully in their sectors, organizational executives must create and execute strategies to enhance business performance (Burt, 2016).

Digitization is the first step in the digital transformation process, and it involves changing the means in which data is saved, transferred, and handled from traditional to digital using advances in digital technology (Atarashi and Kim, 2020). Step two, dubbed "digitization," entails incorporating digital tools into operational procedures to boost productivity. The third, digital change, is much more expansive than the first two because it involves the complete business and not just isolated functions. To turn an organization into a digital one, one must come up with novel

methods of doing business that result in new sources of income and worth (Lim and Palvia, 2019). New methods of value generation and business procedures are what bring about digital change. A digital transition is a massive change in corporate procedure.

Increased device interconnectedness, mobile phone penetration, big data analytics, AI, bitcoin, robotics, and 3D printing are among the primary technologies that have fueled the digital revolution (Lester, 2021). The widespread availability of these digital tools has lowered the threshold for starting a new company, which has drastically changed the competitive environment by opening up previously closed retail marketplaces to global and younger.

competitors. Knowledge management capacity, decision support functionality, storage management, and data normalization are just some of the ways that digital technologies are altering the supply chain process. Organizations are becoming more fluid and adaptable as a result of digital change (Mller, 2020).

2.9 Empirical Review

2.9.1 Impact of ICT Infrastructure on Service Delivery

Various empirical studies have been conducted to establish the impact of ICT infrastructure on service delivery in banking institutions. Kyeremeh et al. (2019) conducted an analysis on the contribution of ICT towards the performance of banks in terms of service delivery in the banking industry in Ghana, concluding that ICTs contribute positively to operational performance with respect to service speed and accuracy. Likewise, Mndzebele (2013) and Mutua (2017) verified that adaptation of ICTs increases service speed and accuracy in African banks. Goonatilake (2020) concluded that with ICT infrastructure, services can be improved through improved reliability and effectiveness in data transfer among members of the supply chain network, thus minimizing uncertainties and improving service performance in the process. With regards to the effects of ICT adoption on bank performance in Sub-Saharan Africa, researchers noted that how an organization supports its operations with ICTs affects firm performance positively. For instance, Solomon (2018) and Tesfaye (2020) in Ethiopia found banking technologies to improve service delivery with challenges due to organizational readiness and infrastructure constraints.

2.9.2 Effect of Digital Integration on Service Delivery

Several researchers have focused on the effects of digital integration, which entails coordination of information and processes among departments within an organization. It has been shown that digital integration minimizes process fragmentation and delays in service delivery by Rajee and Hamed (2018). Similarly, Kache and Seuring (2017) indicated that digital integration in supply chains increases the process effectiveness and efficiency through increased speed, coordination, and decision-making ability. Additionally, Oubrahim et al. (2023) have highlighted that digital transformation and supply chain integration significantly contribute to overall supply chain performance since digital integration enables shorter production cycles and improved effectiveness. Lim and Palvia (2019) revealed that organizations adopting digitalization strategies increase the quality of customer services and minimize inefficiencies in the process. The same was reiterated by Kamanga and Ismail (2017), who noted that successful digital integration into supply networks was a determinant of competitiveness and effectiveness in service delivery.

2.9.3 Effect of Automation on Service Delivery

Automation is one of the areas receiving extensive research into its role as an important determinant of technology use in support of service delivery. According to Levary (2020), automation improves the performance of organizations since it involves eliminating human errors in carrying out activities manually. Research on data-driven process automation within the banking sector found that it makes it possible for employees to minimize the probability of human error, ensures accuracy and consistency, and greatly improves customer experience because of quick response times and round-the-clock services. Automated data capturing was also found by Muchiri, Ombu and Iravo (2017) to be very useful in improving performance outcomes for organizations involved in oil marketing in Kenya. Morris and Wood (2021) further agreed that automation makes it possible for organizations to generate better customer value through reliable and efficient service provision processes. Aboelmaged (2014) also revealed that technology adoption, including automation, improves service delivery performance.

2.9.4 Effect of Interoperability on Service Delivery

Interoperability, which refers to the ability of various systems to exchange information freely, is increasingly seen as fundamental for the success of the supply chain as well as banking sectors. According to Kache & Seuring (2017), effective interaction between the systems ensures

elimination of errors made by people and increases efficiency. The literature on digital transformation in supply chains notes that difficulties in interoperability caused by standard fragmentation and heterogeneous legacy systems result in inefficiency, which stresses the importance of interoperable interaction between the systems for their efficient functioning. Pan et al. (2021) proved that interoperable digital environment is necessary for logistics and supply chain management to be able to ensure coordinated action and improved results in terms of service delivery. Moreover, according to Sanders (2007), IT-based integration of supply chains greatly enhances responsiveness and customer satisfaction. In banking environments in developing countries, incompatibilities between the old and new systems cause disruptions and risks, which makes the issue important strategically.

2.9.5 Effect of Data Sharing on Service Delivery

It has been noted that real-time data sharing is important in improving organizational responsiveness and services. Susanne (2021) indicated that having real-time data increases organizational responsiveness and improves decision-making processes. Studies done concerning information sharing among firms within the supply chain reveal that sharing data effectively enhances firm performance through coordination, reduces information asymmetry, and enhances decision-making. Ghouri et al. (2021) revealed that real-time information receiving through Industry 4.0 technology within downstream activities helps organizations build a competitive advantage based on cost, flexibility, quality, and delivery factors. Peteraf (2020) corroborated that organizations capable of sharing data effectively perform excellently and offer better customer value. Within the banking sector, having access to real-time information helps organizations process transactions fast, coordinate interdepartmentally, and be responsive to customers' needs.

2.9.6 Effect of Organizational Challenges on Service Delivery

In addition to technology-related barriers, organizational barriers have also been shown through empirical studies to play a role as moderating factors in the impact of technology on service delivery results. According to Haber & Carmeli (as cited in Pazhanimala, 2023), organizations in developing countries experience the problems of poor infrastructure, lack of skills, poor integration of systems, and resistance to change, all of which hinder the anticipated positive service delivery results. Through their research, Zhu et al. (2006) found that organizations that adopted systems but lacked appropriate customization or training of employees performed less efficiently than those

that considered all organizational readiness aspects at once. In the case of developing countries, Aboelmaged (2014) reported similar organizational barriers. The research works conducted by Solomon (2018) and Tesfaye (2020) further supported this assertion within the Ethiopian banks environment.

2.10 Conceptual Framework

The conceptual framework of this study is derived from the Technology-Organization-Environment Framework, Technology Acceptance Model and Resource-Based View. The independent variables include supply chain technology adaptation factors, namely technological factors and organizational factors. The dependent variable is service delivery measured in terms of service speed, accuracy, reliability, and customer satisfaction. The framework assumes direct relationships between supply chain technology adoption and service delivery outcomes in the Commercial Bank of Ethiopia. Based on the reviewed literature, the conceptual framework proposes that supply chain technology adaptation factors influence service delivery.

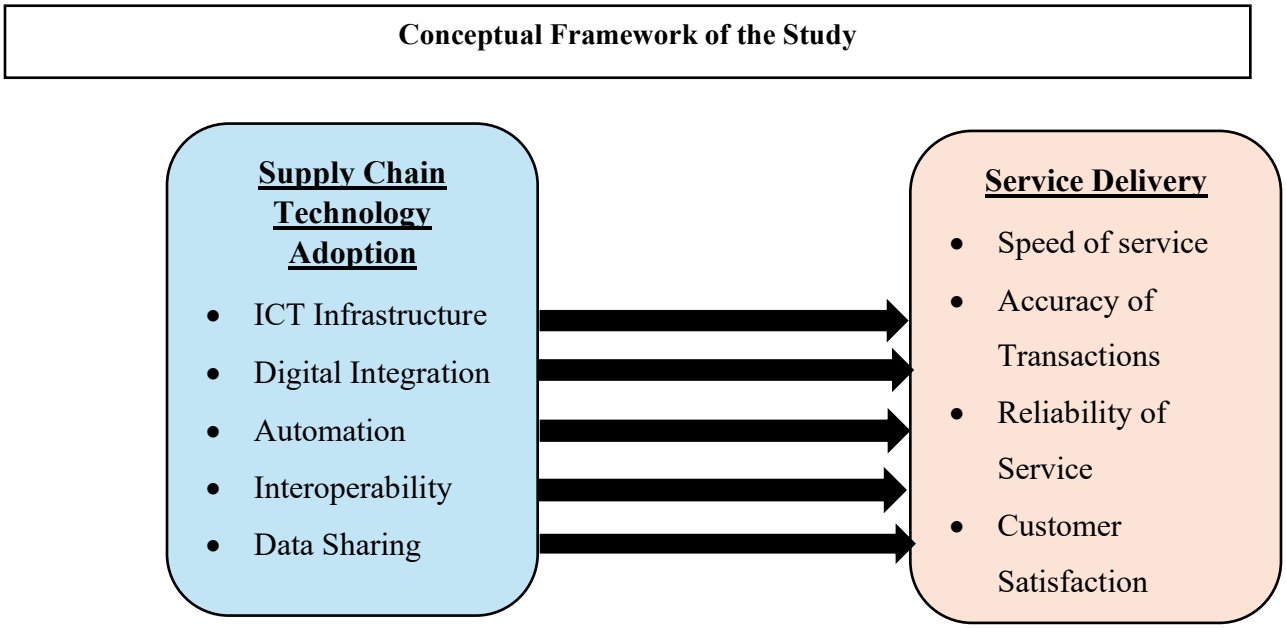


Figure 2.1 Conceptual Framework of the Study

Source: Developed by the researcher (2026)

Hypotheses of the Study

H1: There is a significant impact of ICT infrastructure on service delivery at the Commercial Bank of Ethiopia.

H2: There is a significant impact of digital integration on service delivery at the Commercial Bank of Ethiopia.

H3: There is a significant impact of automation on service delivery at the Commercial Bank of Ethiopia.

H4: There is a significant impact of interoperability on service delivery at the Commercial Bank of Ethiopia.

H5: There is a significant impact of data sharing on service delivery at the Commercial Bank of Ethiopia.

H6: There is a significant impact of organizational challenges on service delivery at the Commercial Bank of Ethiopia.

2.11 Research Gap

The reviewed literature indicates that supply chain technology adoption plays a significant role in enhancing service delivery. Various theories and empirical studies confirm the positive relationship between technology use and organizational performance. However, several gaps are identified. First, limited empirical evidence exists on public banking institutions in Ethiopia, particularly the Commercial Bank of Ethiopia. Second, few studies integrate organizational and technological factors in explaining service delivery outcomes. This study seeks to address these gaps by examining the role of supply chain technology adoption measured through technological factors and organizational readiness in enhancing service delivery outcomes at the Commercial Bank of Ethiopia.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter tells the research approach used to look into how CBE's adoption of supply chain technology improves service performance with the target population sampling strategies and sample size calculation it touches on the research area, methodology and the mixed methods design. It also describes the methods used to interpret both qualitative and quantitative data and also the data source gathering tools and analytical techniques. Finally, it discusses the ethical standard withholding throughout the study to assure the validity and integrity of the research.

3.1 Description of the Study Area

This research was carried out at the Commercial Bank of Ethiopia (CBE), the largest and the oldest commercial bank in Ethiopia which was set up in 1963 and currently operates under the supervision of the National Bank of Ethiopia. As a result of its many branches across the country, the number of which exceeds 1,800, and more than 40 million accounts holders, the number of whom exceeds 35,000, CBE occupies the leading position in the banking sector of Ethiopia (CBE Annual Report, 2023). The bank plays an important role in the implementation of technological innovations in the financial sector of Ethiopia as it introduced several core banking systems including Oracle FLEXCUBE and T-24, and also implemented CBE Birr mobile banking platform. For the purposes of this study, four Addis Ababa branches namely, Abiy, Addis Ababa, Finfine, and Selassie, which have operation managers assigned to the supply chain process, were selected.

3.2 Research Approach

The research approach used in the study was mixed combining both the qualitative and quantitative. In mixed methods research, quantitative and qualitative data are collected, analyzed, and integrated within one study for a deeper comprehension of the research phenomenon being studied than would have been obtained by using any of the two methods in isolation (Creswell & Plano Clark, 2018). The quantitative method was used to examine the extent of technology adoption in the firm's supply chain and the effect it has had on service delivery results through surveys and statistics. The qualitative aspect focused on the views of employees and obstacles

related to technology adoption in the Commercial Bank of Ethiopia through structured interviews with branch managers.

The logic behind such an approach stems from the complementary strengths of each methodology. As suggested by Johnson and Onwuegbuzie (2004), mixed methods approach to research entails not only the strengths of both methodologies but also serves to offset their weaknesses. Quantitative aspects of this research can be seen as necessary in order to measure and generalize relations between different variables. The qualitative dimension is needed to provide in-depth and contextual information which is difficult to derive from statistical data (Tashakkori & Teddlie, 2010). This kind of methodology is most appropriate for this particular study due to its complex nature.

3.3 Research Design

For the research design, explanatory designs was employed. explanatory research is used to explain and measure the relationship between variables (Given, 2008). Thus, the explanatory research was used to examine the relationship between supply chain technology adoption and its impact on service delivery performance at CBE.

3.4 Population and Sample

3.4.1 Target Population

The number of employees in each of the four branches differs, where the Abiy branch has 45, Addis Ababa has 73, Finfinne has 44, and Selassie has 41 employees. Therefore, the total target population for this study was 203 employees.

For the questionnaire participants, we used census method, which chose respondents who had direct relevance to the topic and their level of knowledge about supply chain technology and service delivery processes. The researcher considered 195 employees as part of the census because it excluded 8 managers who were part of the interview.

Participants who were part of the interview were selected using purposive sampling, as the employees who were selected are expected to have more understanding, expertise, and decision-making roles related to technology adoption and the role it will have when it comes to enhancing service delivery. The participants included operations managers, and customer service managers.

3.5 Data Sources and Types

3.5.1 Primary Data

Primary data was collected through questionnaires and interviews. Questionnaires was distributed to front-line employees at the four bank branches selected for the study. Operations managers and customer service managers from these branches did not participate in the questionnaire; instead, they were interviewed.

3.6 Data Collection Procedures

Initially, both questionnaires and interview were developed. The questionnaire included demographic items as well as questions designed to measure and assess the level of technology usage, perceived usefulness, perceived ease of use, organizational readiness, and service delivery indicators. The questionnaire was structured and employed a five-point Likert scale for responses. Once the questionnaire was prepared and approved for distribution, the researcher distributed and collected the questionnaire responses among 195 employees across the four branches, and while distributing the questionnaire, the researcher ensured the participants were comfortable with taking part in the research and received their consent.

The interview was structured and involved four operations managers, four customer service managers, which would be a total of eight managers from the four branches. The questions included in the interview was used to gather deeper information on challenges of technology adoption, perceived improvements in service delivery, managerial perspectives, and organizational readiness. Before conducting I, reached out to the participants to receive consent and set up appointments, then did the interviews based on the agreed-upon time and date but needed to make some rescheduling for some of them.

3.7 Data Analysis

3.7.1 Quantitative Analysis

Quantitative analysis was carried out using SPSS v.25 in carrying out descriptive statistics, Pearson correlation analysis, and multiple linear regression analysis since the research sought to establish the connection between supply chain technology and how it enhances service delivery.

This model was built based on the conventional method of estimating the relationship between a dependent variable and a number of independent variables through the ordinary least squares regression model (Field, 2018). The measurement of all variables used composite mean values generated through the use of a 5-point Likert scale. Before the interpretation, all the necessary

assumptions for the OLS regression were validated to determine the correctness of the model estimates.

3.7.2 Qualitative Analysis

The qualitative data obtained from the structured interviews with eight branch managers was analyzed using thematic analysis. This involved systematically identifying, organizing, and interpreting recurring patterns and themes related to employee perceptions and operational challenges in technology adoption at CBE **(Braun & Clarke, 2006)**.

Reliability Statistics

Construct	Items	N of Items	Cronbach's α	Interpretation
ICT Infrastructure	ICEMEAN	6	**0.822**	Good
Digital Integration	DIGIMEAN	6	**0.902**	Excellent
Automation	AUTOMEAN	6	**0.911**	Excellent
Interoperability	INTERMEAN	6	**0.907**	Excellent
Data Sharing	DATSMEAN	6	**0.907**	Excellent
Service Delivery	SDMEAN	4	**0.870**	Good
Challenges	CHALLMEAN	5	**0.845**	Good

Table Reliability Statistics

Note: $\alpha \geq 0.90$ = Excellent; 0.80–0.89 = Good; 0.70–0.79 = Acceptable (George & Mallery, 2003)

3.8 Ethical Consideration

The study ensured that while collecting primary data, it received institutional permission from CBE, as well as ensured the voluntary participation of the participants, received informed consent from them, and maintained confidentiality of their information.

CHAPTER FOUR

RESULTS, DISCUSSION AND INTERPRETATION

Under this chapter, the analysis and interpretation are carried out based on the data collected through questionnaires distributed and interviews at the four branches of CBE, namely Abiy, Addis Ababa, Finfine, and Selassie, located in Addis Ababa. The data was analyzed using Statistical Package for Social Science (SPSS v.25). Of the 195 questionnaires distributed to employees, 193 were completed, and 2 employees did not respond. As for the interview, all eight managers participated. The response rate is approximately 99%. According to Mugenda (2003), a response rate of 50 percent is adequate for data analysis and reporting; a rate of 60 percent is good. Thus, this research result has a response rate of 99%, which is extremely good.

4.1 Demographic Analysis

The following tables in this section present the frequency distribution of respondents by gender, age, education, work experience, and department.

Gender	**Frequency**	**Percentage (%)**
Male	98	50.8
Female	95	49.2
Total	193	100
Age	**Frequency**	**Percentage (%)**
18–25	41	21.2
26–35	98	50.8
36–45	39	20.2
46 +	15	7.8
Total	193	100
Education Level	**Frequency**	**Percentage (%)**
Diploma	22	11.4
Degree	122	63.2
Master's	36	18.7
Other	13	6.7

Total	193	100
Work Experience	**Frequency**	**Percentage (%)**
Less than 2 years	48	24.9
2–5 years	74	38.3
6–10 years	45	23.3
More than 10 years	26	13.5
Total	193	100
Department	**Frequency**	**Percentage (%)**
Operation	68	35.2
Sales	76	39.4
Service	49	25.4
Total	193	100

Table 4.1 Demographic Analysis

The gender distribution of the respondents, where the male respondents are very slightly higher, 50.8%, than female respondents who represent 49.2%. Therefore, there is relatively equal number of female and male employees.

The age distribution where majority of the respondents, 50.8% are between the ages of 26-35. This shows that majority of the respondents are in prime working age.

Most of the respondents, 63.2% hold a bachelor's degree, 18.7% hold a master's degree, and 11.4 hold a Diploma. While the remaining 6.7% are not part of the three education level listed on the questionnaire. The education level distribution indicates that majority of the respondents have a good academic qualification which makes them understand the concept of the variables and respond to the questionnaires.

Majority of the respondents, 38.3%, have work experience of two to five years while 24.9% have worked for less than two years, 23.3% for 6-10 years and the remaining 13.5% have worked for

more than 10 years. Therefore, most of the employees have work experience of more than 2 years which allows them to provide information.

In regard to employees' departments involved in the questionnaire, sales department employee participants are at slightly higher percentage, 39.4%, compared to operations department, 35.2 %. The remaining, 25.4% are from the service department.

4.2 Reliability Analysis

4.2.1 Reliability Statistics

Construct	Items	N of Items	Cronbach's α	Interpretation
ICT Infrastructure	ICEMEAN	6	**0.822**	Good
Digital Integration	DIGIMEAN	6	**0.902**	Excellent
Automation	AUTOMEAN	6	**0.911**	Excellent
Interoperability	INTERMEAN	6	**0.907**	Excellent
Data Sharing	DATSMEAN	6	**0.907**	Excellent
Service Delivery	SDMEAN	4	**0.870**	Good
Challenges	CHALLMEAN	5	**0.845**	Good

Table 4.2 Reliability Statistics

Note: $\alpha \geq 0.90$ = Excellent; 0.80–0.89 = Good; 0.70–0.79 = Acceptable (George & Mallery, 2003)

4.2.2 Reliability Analysis

A series of Cronbach's alpha reliability analyses were conducted to evaluate the internal consistency of the multi-item scales used in this study (N = 193). In academic research, Cronbach's alpha coefficient above .70 indicates acceptable reliability, while values exceeding .80 are interpreted as very good to excellent.

As detailed, all seven scales demonstrated strong to excellent internal consistency. Overall Cronbach's alpha coefficients ranged from a low of \alpha = .822 (for ICT Infrastructure) to a high of \alpha = .911 (for Automation), with all constructs safely exceeding the standard minimum acceptable threshold of .70. Furthermore, corrected item-total correlations across all scales were highly robust (ranging from .463 to .868), confirming that individual survey items strongly correlated with their respective overall constructs. An examination of the item-deleted alpha

variations indicated that the structural removal of any individual query would fail to meaningfully improve the reliability of its baseline scale. Consequently, all items were retained, and composite scores were calculated for subsequent inferential testing.

4.3 Descriptive Statistics

Descriptive statistics were analyzed to sum up the sample size minimum and maximum value, means and standard deviation for aggregated composite scale variables. Responses were measured on a 5-point scale (1 = Strongly Disagree, 5 = Strongly Agree). Mean values between 3.40–5.00 indicate agreement; 2.60–3.39 indicate neutrality; and below 2.60 indicate disagreement.

	N	Minimum	Maximum	Mean	Std. Deviation
ICTMEAN	193	1.33	4.83	3.1589	.89580
DTMEAN	193	1.33	5.00	3.3834	1.04531
AUTOMEAN	193	1.17	5.00	3.4249	1.07245
INTERMEAN	193	1.33	5.00	3.3826	1.05273
DATMEAN	193	1.17	4.83	3.4102	1.06854
SDMEAN	193	1.00	5.00	3.4339	1.08035
CHLLMEAN	193	.80	3.80	2.6083	.80308
Valid N (listwise)	193				

Table 4.3 Descriptive Statistics

Descriptive statistics for all variables under study are provided in Table 4.3, which is based on mean and standard deviation calculated from the composite score based on a 5-point Likert scale, in which the scores of 3.40–5.00 suggest agreement, 2.60-3.39 suggest neutral response, while below 2.60 suggests disagreement (George & Mallery, 2003).

ServiceDelivery(SDMEAN):M=3.4339,SD=1.08035

On the dependent variable, service delivery obtained the highest mean of M = 3.4339 out of all the variables, positioning it on the lowest limit of the agreement scale. The result demonstrates that respondents' views of the current level of service delivery are mostly favorable although the rather

high standard deviation of SD = 1.08035 shows that there is great disparity in opinions about the issue, possibly owing to the disparities in branch capacity.

ICT Infrastructure (ICTMEAN): M = 3.16, SD = 0.896

The ICT dimension scored the lowest in terms of mean scores as well as being in the neutral category, with M = 3.16. It means that ICT infrastructure receives quite moderate and cautiously optimistic ratings on the part of survey participants. Such a rating reflects the results of qualitative research, during which managers complained about frequent network downtimes, aging hardware, and limited resources as key difficulties of daily operations at CBE. Therefore, one may conclude that although ICT infrastructure is perceived as necessary, it is not yet sufficient to boost services on its own.

Digitalintegration(DTMEAN):M=3.38,SD=1.045

Similarly, the mean for digital integration was found to lie within the range of neutral responses, which was M = 3.38. Although there has been some improvement in terms of inter-departmental coordination via the use of advanced software programs such as Oracle and T-24, the meaning indicates that the shortcomings related to digital integration persist. This is supported by the qualitative data gathered from the managers who observed certain incompatibilities between existing and new software.

Automation(AUTOMEAN):M=3.4249,SD=1.072

Of all independent variables tested, automation (AUTOMEAN) had the highest mean score at M = 3.4249, meaning it falls within the 'agree' range. This is an indication that employees strongly agree on the effectiveness of automation in facilitating business operations at CBE. The findings are supported by the regression analysis result, which identifies automation as having the strongest influence on service delivery ($\beta = .224$, $p = .007$). Moreover, qualitative data reveals that out of eight managers interviewed, all agreed that automation has facilitated faster transaction processes and minimized errors made by humans through reducing paperwork.

Interoperability(INTERMEAN):M=3.38,SD=1.053

Interoperability was measured with an average of M = 3.38, lying in the neutral category, meaning that interoperability among systems is perceived to be fairly efficient although not yet fully maximized. This observation aligns with the regression model showing that interoperability is the

second strongest determinant of the service delivery process (β = .214, p = .004). With the achievement of a neutral average score, it can be stated from the qualitative study that although core systems are communicating efficiently, there are problems with synchronization of Oracle and T-24 leading to inefficiencies and fraud possibilities.

DataSharing(DATSMEAN):M=3.4102,SD=1.069

Data sharing showed a mean value of M = 3.4102; hence, it falls within the bottom limit of the agreement category together with automation. Therefore, this suggests that data sharing is considered important and positive by the participants as an enabler of operational responsiveness. Although data sharing was not found to be a statistically significant predictor of operational performance in the regression analysis model (β = .096, p = .225), the high mean value of 3.4102 shows its practical importance, which was supported by qualitative data from all eight managers that mentioned data sharing to be important for responding to customers' requests.

OrganizationalChallenges(CHLLMEAN):M=2.6083,SD=0.803

The variable organizational challenges had the least mean of all the measures studied at M = 2.6083. It was situated on the borderline between neutrality and disagreement, which indicates that operational challenges do not overwhelm employees at the organization. This means that, overall, CBE is characterized by an atmosphere of support concerning its operations. However, the results of such research should be viewed with care since, despite the low mean, this measure cannot serve as proof of the absence of challenges within the organization. It can just as well point at the existence of some normalizing tendencies among the employees. Furthermore, according to the findings of the regression analysis, there was a direct and statistically significant relationship between challenges and service delivery (β = .155, p = .016).

4.4 Regression Assumption: Test of Normality

4.4.1 Assumption Testing: Normality of Residuals

Another important assumption of multiple linear regression analysis is the approximate normal distribution of the errors (residuals) of the regression model. The violation of this assumption may have serious consequences for testing the hypotheses and constructing confidence intervals. The following three alternative methods were used to test this assumption: (1) visual check on the Normal P-P Plot for standardized residuals from the regression analysis, (2) visual check on the

histogram of standardized residuals plotted together with the normal curve, and (3) formal tests for normality including Kolmogorov-Smirnov and Shapiro-Wilk tests.

4.4.1.1 Normal P-P Plot of Regression Standardized Residual

Normal Probability Plot (P-P plot): This involves comparison of the cumulative distribution of standardized residuals with the theoretical cumulative distribution that is expected to be observed in case of a normal distribution. In case the residuals are normally distributed, there should be close adherence to the 45° reference line; deviation from it indicates non-normality.

From Figure 4.1 provided below, it can be seen that the actual cumulative probability values match quite well with the theoretical cumulative probability values on the diagonal reference line. No signs of systematic S-curve shape, clustering or deviation from the diagonal are observed in the plotted points, and there is some small amount of random dispersion around the diagonal. This is expected behavior for a data sample of this size (N = 193).

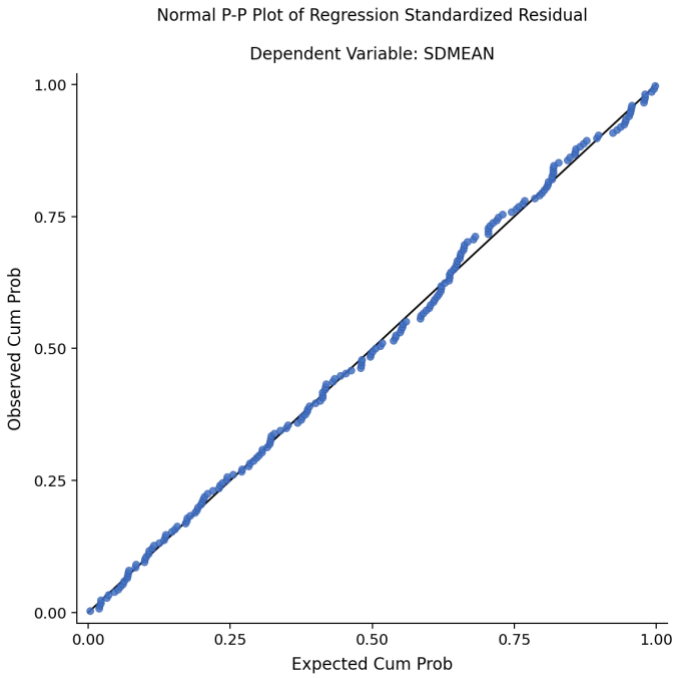


Figure 4.1 Normal P-P Plot of Regression Standardized Residual (Dependent Variable: SDMEAN)

4.4.1.2 Histogram of Standardized Residuals

The plot of histograms with the regression standardized residual distribution curve gives another method for evaluating the assumption of normality. A histogram that is symmetric and shaped like a bell curve around the origin indicates that the assumption of normality holds.

Histograms of the regression standardized residuals are shown in Figure 4.2. The histogram is symmetric and bell-shaped, with a mean value of 0.00 and a standard deviation of 1.000 (N = 193). It appears that the histogram is reasonably aligned with the normal curve, and no signs of asymmetry or tail weight are seen.

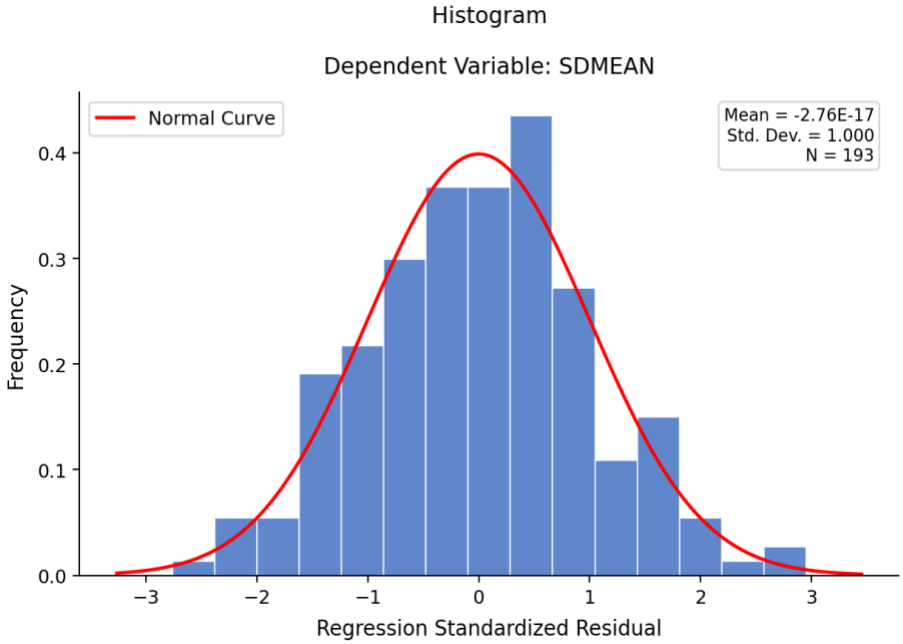


Figure 4.2 Histogram of Regression Standardized Residuals with Normal Curve Overlay (Dependent Variable: SDMEAN)

4.4.1.3 Formal Tests of Normality

To support the diagnostic plots, two normality tests for standardized residuals were carried out statistically. These were the Kolmogorov-Smirnov (K-S) test and the Shapiro-Wilk (S-W) test. In both tests, the null hypothesis that residuals are normally distributed is not rejected when the p-value is greater than .05.

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Standardized Residual	.038	193	.934	.996	193	.904
a. Lilliefors Significance Correction						

Table 4.4 Tests of Normality — Regression Standardized Residuals

	N	Mean	Std. Dev.	Skewness	Kurtosis	S-W Sig.
Standardized Residual	193	0.000	1.000	.129	-.010	.904

Table 4.5 Descriptive Statistics of Standardized Residuals

4.4.1.4 Interpretation and Conclusion

The findings from the normality tests can be found in Table 4.9. The Kolmogorov-Smirnov statistic was D(193) = .038, p = .934, while the Shapiro-Wilk statistic was W(193) = .996, p = .904. Both statistics provide a p-value that is considerably higher than the .05 significance level, meaning that there is no significant deviation from a normally distributed dataset.

All three approaches to determining whether the assumption has been fulfilled or not have been used – these are the Normal P-P Plot (Figure 4.1), the Histogram with a normal distribution overlay (Figure 4.2), and the formal normality tests (Table 4.9). Together, they allow us to conclude that the assumption of normality is fulfilled. The variables are normally distributed and, therefore, the OLS regression analysis can be conducted properly.

Summary- Normality Assumption

Kolmogorov-Smirnov: D (193) = .038, p = .934 (p > .05) Normality assumption not violated

Shapiro-Wilk: W (193) = .996, p = .904 (p > .05) Normality assumption not violated

Skewness = .129 | Kurtosis = −.010 (both within acceptable range of ±2.0)

Conclusion: The normality assumption of the OLS regression model is fully satisfied. The regression results are valid and reliable.

4.5 Assumption Testing: Linearity

The linearity assumption of ordinary least squares (OLS) regression requires that a linear relationship exists between each independent variable and the dependent variable. Violation of this

assumption means the regression model systematically under- or over-predicts at different ranges of fitted values. The primary diagnostic tool is a scatterplot of regression standardized residuals against regression standardized predicted values.

4.5.1 Diagnostic Plot: Standardized Residuals vs. Standardized Predicted Values

The scatter plot of the regression standardized residuals (Y-axis) versus the regression standardized predicted values (X-axis) is shown in Figure 4.3. If the assumption of linearity is true, then the residuals must be randomly and symmetrically scattered about the horizontal line with zero reference. There must be no discernable pattern, curve, or trend in the scatter.

It can be observed from the scatter plot given in Figure 4.3 that the distribution of residuals is random and evenly distributed along the zero line irrespective of the predicted values. There is no curvature, U-shape, or direction in the trend line indicated by the dashed line. The scatter plot is consistent with linearity.

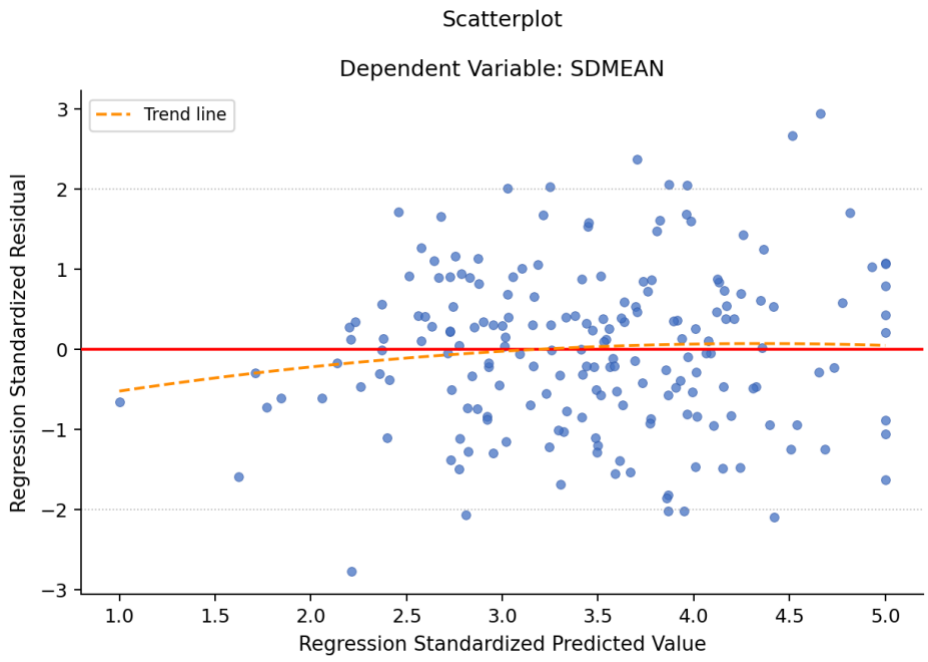


Figure 4.3 Scatterplot of Regression Standardized Residuals vs. Standardized Predicted Values (Dependent Variable: SDMEAN)

4.5.2 Interpretation and Conclusion

The residual plot presented in Figure 4.3 demonstrates no curvature or systematic deviation from the zero-reference line. There is evidence of randomness in the distribution of residuals centered on the zero line, which indicates that the linearity assumption holds.

The residual plot (Figure 4.3) indicates that there is neither any curvature nor any structural pattern evident in it. Points are scattered randomly around the zero line regardless of the predictions made, which suggests that the linear relationship between Supply Chain Technology Adoption dimensions and Service Delivery is appropriately modeled through linear regression.

Summary- Linearity Assumption

Diagnostic: Scatterplot of Standardized Residuals vs. Standardized Predicted Values

Observation: Residuals scattered randomly around zero with no systematic curve or pattern

Trend line: Remains approximately horizontal with no U-shaped or directional drift

Conclusion: Linearity assumption is SATISFIED. A linear model is appropriate for this data.

4.6 Assumption Testing: Heteroscedasticity (Homoscedasticity)

Homoscedasticity assumes that the variance of the residual does not vary with respect to any level of predicted value (or in other words, it is assumed that the spread of the residuals does not vary at any point of predicted values). If homoscedasticity is not fulfilled, it results in heteroscedasticity. Under such a scenario, the OLS coefficient will be unbiased, but its standard error becomes invalid.

4.6.1 Diagnostic Plot: Scale-Location Plot

The Scale-Location plot is illustrated in Figure 4.4. This type of plot depicts the square root of absolute standardized residuals on the y-axis and regression standardized predicted values on the x-axis. If the data exhibit homoscedasticity, the variability between the points will be fairly consistent throughout the graph without displaying any trends.

According to Figure 4.4, the variation within the points does not change along the whole range of predicted values. In particular, the trend line depicted in red color fluctuates minimally without

indicating an increasing or decreasing trend from left to right. It should be noted that there is no presence of funneling (narrowing/widening) in the scatterplot of residuals.

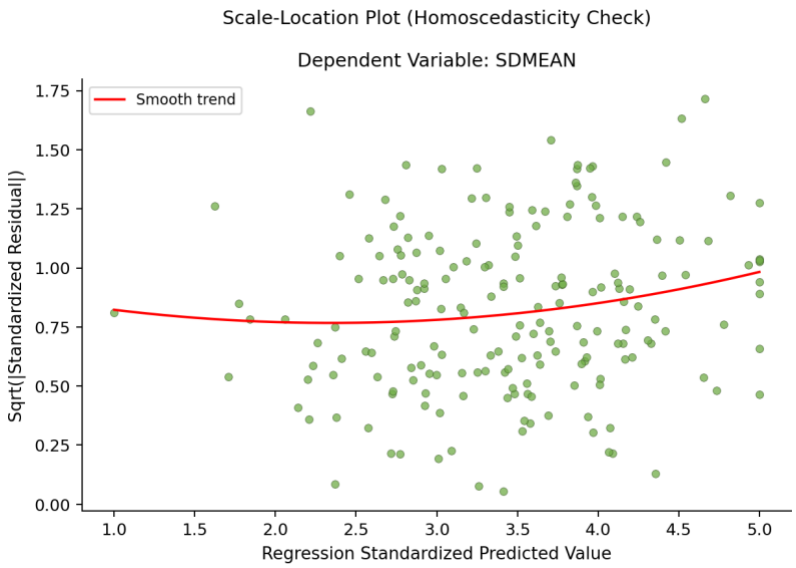


Figure 4.4 Scale-Location Plot — Sqrt (\|Standardized Residual\|) vs. Standardized Predicted Values (Dependent Variable: SDMEAN)

4.6.2 Formal Test: Breusch-Pagan Test

To supplement the visual diagnostic, the Breusch-Pagan test was conducted to formally assess whether the variance of residuals is significantly related to the predicted values. A non-significant result ($p > .05$) supports the homoscedasticity assumption.

Test	Test Statistic	df	p-value
Breusch-Pagan Test	3.253	1	.071
p > .05 indicates homoscedasticity (constant variance). Dependent Variable: SDMEAN			

Table 4.6 Breusch-Pagan Test for Heteroscedasticity

The Breusch-Pagan test yielded a test statistic of 3.253 with $p = .071$, which exceeds the .05 significance threshold. This non-significant result indicates that the variance of the residuals is not significantly related to the predicted values, confirming that heteroscedasticity is not present in this model.

4.6.3 Interpretation and Conclusion

As seen from both the visual Scale-Location plot (Figure 4.4) and the statistical Breusch-Pagan test (Table 4.11), the homoscedasticity assumption holds true in this case. There is no variation in

the variance of residuals as the values of the predicted Service Delivery vary. The standard errors produced by OLS can be considered valid for hypothesis testing purposes.

Summary - Homoscedasticity Assumption

Diagnostic Plot: Scale-Location Plot (Figure 4.4)

Observation: Residual spread is approximately uniform across all predicted values

No funnel-shaped pattern detected (no widening or narrowing of residuals)

Breusch-Pagan Test: Statistic = 3.253, p = .071 (p > .05) — Not significant

Conclusion: Homoscedasticity assumption is SATISFIED. Error variance is constant. Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE Publications.

4.7 Multiple Linear Regression Analysis

Multiple linear regression was conducted to examine the simultaneous effect of all five independent variables (ICT Infrastructure, Digital Integration, Automation, Interoperability, and Data Sharing) on Service Delivery. Composite mean scores were used for each variable.

Model	R	R^2	Adjusted R^2	Std. Error
1	0.925	0.855	0.851	0.489

Table 4.7 Multiple Regression Analysis Variable

4.5.1 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
		B	Std. Error	Beta			Tolerance
1	(Constant)	.005	.111		.047	.962	
	ICTMEAN	.118	.076	.098	1.555	.122	.193
	DTMEAN	.197	.085	.190	2.312	.022	.112
	AUTOMEAN	.226	.083	.224	2.723	.007	.112
	INTERMEAN	.219	.074	.214	2.952	.004	.144
	DATMEAN	.097	.079	.096	1.219	.225	.123
	CHLLMEAN	.209	.086	.155	2.427	.016	.185

Table 4.8 Regression Coefficients

4.5.2 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	**Regression**	192.524	6	32.087	189.044	<.001[b]
	Residual	31.571	186	.170		
	Total	224.095	192			

Table 4.9 ANOVA Results

a. Dependent Variable: SDMEAN
b. Predictors: (Constant), CHLLMEAN, ICTMEAN, INTERMEAN, AUTOMEAN, DATMEAN, DTMEAN

The Analysis of Variance (ANOVA) was conducted to determine whether the regression model significantly predicts Service Delivery (SDMEAN). The results show that the overall model is statistically significant, $F(6, 186) = 189.044$, $p < .001$, indicating that the independent variables collectively have a significant effect on service delivery. These variables include Challenges, ICT Infrastructure, Interoperability, Automation, Data Sharing, and Digital Integration.

4.5.3 Model Fit and Variance Overview

The overall regression model demonstrated a highly robust statistical fit, with an overall model significance of $F(6, 186) = 189.044$, $p < .001$. The model summary results show a multiple correlation coefficient (R) of .927 and an R Square value of .859 (Adjusted $R^2 = .855$). This confirms that the combined independent variable set accounts for 85.9% of the overall variance found in Service Delivery (SDMEAN), representing a powerful explanatory effect size. The standard error of the estimate for the model is .41199.

Regression Coefficients							
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF

1	(Constant)							
	ICTMEAN	.118	.076	.098	1.555	.122	.193	5.194
	DTMEAN	.197	.085	.190	2.312	.022	.112	8.958
	AUTOMEAN	.226	.083	.224	2.723	.007	.112	8.963
	INTERMEAN	.219	.074	.214	2.952	.004	.144	6.927
	DATMEAN	.097	.079	.096	1.219	.225	.123	8.129
	CHLLMEAN	.209	.086	.155	2.427	.016	.185	5.415

Table 4.10 Regression Coefficients with VIF

Note: Dependent Variable: SDMEAN. R = .927, R Square = .859, F = 189.044 ($p < .001$).

Out of the six corporate independent predictors evaluated in the model, four were found to be statistically significant unique drivers of Service Delivery:

1. Automation (AUTOMEAN) emerged as the strongest statistically significant unique positive predictor of Service Delivery ($\beta = .224$, $t = 2.723$, $p = .007$).
2. Interoperability (INTERMEAN) proved to be the second most impactful significant driver within the framework ($\beta = .214$, $t = 2.952$, $p = .004$).
3. Digital integrations (DTMEAN) was also a significant unique positive predictor ($\beta = .190$, $t = 2.312$, $p = .022$).
4. Challenges (CHLLMEAN) maintained a significant but weaker positive unique relationship with the dependent variable ($\beta = .155$, $t = 2.427$, $p = .016$).

Conversely, Data Sharing (DATMEAN) ($\beta = .096$, $p = .225$) and ICT Infrastructure (ICTMEAN) ($\beta = .098$, $p = .122$) were not statistically significant unique predictors within this regression model. Once the other organizational variables are controlled for, they do not add unique explanatory value to Service Delivery.

4.6 Collinearity Diagnostics and Explanatory Context

In table 4.12, the collinerarity statistics shows the variance inflation factors, ranging from 5.194 to 8.963, which exceeds standard VIF conservative thresholds of greater than 5.0. Through this it can be observed that among these independent variables there exists a high level of multicollinearity. Despite the strong correlation of ICTMEAN and DATMEAN with service delivery in raw

bivariate correlation tests, their multi-variable overlap explains that they did not reach individual statistical significance. Since these platforms function as greatly interconnected components of an integrated corporate technology network, they share a large amount of overlapping variance. However, instead of an isolated parameter, the primary goal of this model is overall variance explanation, R^2 is 85.9% , thus the model structure was secured without removing a variable.

4.7 Qualitative Findings

This part of the chapter provides the data that was gathered from conducting interviews with the eight managers across the four branches.

4.7.1 ICT Infrastructure

A. Effect of ICT Infrastructure on Service Delivery

According to the managers, ICT infrastructure affects service delivery, where it plays a significant role in supporting banking operations efficiency and improving communication. The ICT infrastructure plays a crucial role in ensuring the reliability and consistency of service delivery, including reducing service delivery time, minimizing delays, enhancing digital services, and facilitating faster access to information and transaction processing, which in turn contributes to an improved customer experience. However, when the ICT infrastructure falters, such as when some branches experience network interruptions and system downtime, the entire supply chain might grind to a halt and consistency in service delivery will be affected.

B. Evaluation of the Current Infrastructure

While some managers stated the infrastructure is functional, sufficient to some extent or relatively good compared to previous years. The remaining managers stated that it is not sufficient due to resource limitations, the hardware and connectivity are lagging, and they have experienced almost daily network instability and network failure at their branches. For the managers who stated the infrastructure is somehow sufficient, they also indicated that with future digital transformation and growing technological demands, the systems are outdated and require upgrades to support increasing customer demand, operational complexity, and advanced digital operations.

4.7.2 Digital Integration

A. System integration across departments

While the managers indicated that the system integration across departments is moderately integrated when it comes to information flow or sharing operational information. These systems are especially integrated between procurement, finance, and operations departments; there is also a digital thread connecting procurement to frontline service. However, there are still coordination challenges and gaps in synchronization where some processes still require manual coordination, and some departments face delays when exchanging information.

B. Integration Challenges

According to the managers, the main challenges when it comes to integration include lack of compatibility and maintaining consistency between legacy systems or older systems with modern applications; lack of timely system updates, data synchronization, overall system downtime, and lack of reliability when it comes to network or connection.

4.7.3 Automation

A. Effect of Automation on Efficiency and Service Delivery

Based on the managers' response, overall automation has significantly reduced paperwork and processing times, shifting the bank away from the era of manual ledger entries. All these factors have led the bank to have increased productivity, reduced repetitive tasks and workload for employees, minimized human errors, increased efficiency in processing transactions and operational activities, improved operational consistency, minimized operational errors, lowered operational costs and improved overall service delivery as employees can now focus more on customer support and decision-making activities.

4.7.4 Interoperability (Compatibility)

A. Effectiveness of System Communication

When it comes to core operational activities, the system communicates effectively for the most part; however, occasionally, technical problems, connectivity issues, and delays occur because

certain systems are not fully integrated. The bank uses the Oracle system for procurement, such as cash for the operation and ATM and any material that is essential for customers, like cheque books, where it handles “what the bank needs”, and T-24 handles the customer account or “who it belongs to”, such as registering customers on the system and linking with accounts.

B. Problems that can Arise from Lack of Interoperability

Managers stated that the problems that can arise from a lack of interoperability include service disruption, service delays, a high chance of system error, communication problems, poor customer satisfaction, affecting workflow coordination, delaying operational decisions, creating inconsistencies, and financial and operational risks, such as creating a window where fraud can occur because the real-time validation of a material's movement is lost.

4.7.5 Data Sharing

A. Effectiveness of Data Sharing Across Departments

Managers indicated that data sharing has improved over time and is relatively effective, where it supports better operational coordination among departments, smoother workflow management, and helps the bank in being efficient in terms of fast data exchange.

C. Influence of Data Sharing on Decision-making and Service Delivery

According to the managers, using data leads to efficient, informed and timely decision- making as it allows decisions to be data-driven using real-time and accurate data shared across divisions. Additionally, it improves transparency, helps management respond more quickly to operational issues, and improves service quality and service delivery speed.

4.7.6 Service Delivery

A. Technology Adoption Effect on Service Delivery

Managers stated that technology adoption, including the bank moving from a "stationary" model to a "mobile" model, has improved customer satisfaction, increased service quality, reduced waiting time, and increased operational efficiency. They have also stated that it reshaped service delivery by enabling faster, efficient, and personalized interaction, focusing on complex customer

needs, increased accessibility, automation of routine tasks and self-service operation. However, continuous technological improvement is still necessary.

B. Dimension with Greatest Impact- IT infrastructure, Automation, Data Sharing, Data Integration, or Compatibility

Of the eight managers who were interviewed, four of them indicated that IT infrastructure has the greatest impact, as it is the basis for all of them, and all the other technological activities are dependent on it. One manager stated that compatibility and interoperability have the greatest impact because connected systems improve overall operational performance. Another stated that data sharing improves coordination and organizational responsiveness. For the remaining two, one indicated digital integration because it connects departments and improves workflow efficiency, and the other stated automation because it directly improves efficiency, speed, and accuracy in service delivery.

4.7.7 Challenges

A. Major Challenges in Adopting Supply Chain Technologies

Branch managers found a number of significant obstacles to the adoption among those were ICT infrastructure shortages such as poor internet access and power disruption which leads to expense and rendering equipment unusable 30% of the time. Financial limitations such as limited fund, implementation cost in addition to new cybersecurity issues, this physical barrier lastly there are still major issues with human resources including the lack of IT personnel with the well technical skills, ongoing system training.

A. Limitations of Effective Implementation

The limitations for effective implementation include lack of specialized manpower, lack of proactive support across different divisions, lack of continuous system upgrades, technical issues, limited technical support, inconsistent or limited infrastructure and system integration, and limited financial resources.

B. Areas of improvement recommended by managers

- The bank needs to improve its system and train its employes often.
- It should invest more on ICT infrastructure to improve its overalls.

- The organization should improve infrastructure stability.
- The bank should improve system compatibility, invest in infrastructure, and strengthen employee capacity-building programs.
- Continuous technology upgrades, stronger integration systems, and more employee training should be prioritized.
- Need to coordinate and strong community.
- Need to stop patching old problems and invest in a "resilience first" strategy. This means robust power backups for all branches and a redundant fiber network. Also need to foster a stronger internal community where IT and Operations act as one unit rather than separate silos

4.8 Triangulation of Quantitative and Qualitative Findings

Triangulation refers to the process of integrating data collected from various sources as a means of validating results and improving overall conclusions from a research study (Creswell & Plano Clark, 2018). This study used the combination of quantitative data gathered using structured surveys along with multiple linear regressions with qualitative data gained through structured interviews of eight branch managers at four CBE branches. This paper highlights the convergences and divergences of results within each dimension.

ICT Infrastructure

Based on quantitative results, ICT infrastructure did not emerge as an independent variable that predicted service delivery as statistically significant ($\beta = .098$, $p = .122$). On the other hand, ICT infrastructure exhibited significant bivariate correlation with service delivery ($r = .848$, $p < .001$). Qualitative results align with the quantitative finding in the sense that while ICT infrastructure is perceived by all eight managers to play an important foundational role in facilitating service delivery, network interruptions, obsolete equipment, and other constraints hinder ICT infrastructure's ability to independently predict improvement in service delivery.

Digital Integration

Quantitative results revealed digital integration as a statistically significant factor predicting service delivery ($\beta = .190$, $p = .022$). Qualitative results show that there is an alignment, but only to some extent, since managers found better cooperation between procurement and operations due to the Oracle system, along with mentioning that linked departments ensure more efficient

workflows. On the other hand, there is a slight discrepancy in that even though the regression proved statistical significance, managers pointed out the continued incompatibility between Oracle and T-24 legacy systems as a constraint

Automation

Findings from triangulation show that automation shows the highest level of convergence on both strands. In the quantitative strand, automation was shown to be the greatest predictor of service delivery ($\beta = .224$, $p = .007$). In the qualitative strand, the eight managers interviewed unanimously agreed that automation had the biggest impact on operations such as reduction in paperwork, human errors, and faster transactions. Examples include cash management through T-24 and materials ordering through Oracle. Therefore, the complete convergence of data from both strands makes automation the most critical factor.

Interoperability

The two strands have one thing in common, which is interoperability. Statistically speaking, interoperability proved to be the second most significant predictor of service delivery, with the β value being .214 and p value equaling .004. On the other hand, managers agreed that there were communication problems only when it came to synchronization between Oracle and T-24 systems; however, in general, the systems communicated sufficiently well. It is worthy of mentioning that one manager pointed to interoperability as the most crucial dimension.

Data Sharing

A clear difference can be observed in terms of the statistical analysis and qualitative interviews concerning the concept of data sharing. While the quantitative analysis revealed that data sharing was not an independent predictor ($\beta = .096$, $p = .225$), the qualitative aspect revealed that all eight managers viewed data sharing as very important, with one even citing it as the most important aspect of the customer response time. The difference here does not make the results contradictory; rather, it reinforces that the value of data sharing at CBE is evident yet interdependent and shared with automation and digitalization.

Organizational Challenges

In both strands, the issue of importance of organizational challenges cannot be overlooked. In the quantitative analysis, challenges were significantly positively related to service delivery (β = .155, p = .016). In the qualitative analysis, the main challenges pointed by all eight participants were network outage, skill shortage, budget limitation, system incompatibility, and change resistance. The agreement found from the analysis in both strands demonstrates that organizational challenges are not peripheral issues; rather, they actively affect service delivery at CBE.

4.9 Finalized Hypothesis Testing Summary Table

H	Hypothesis Structural Path	Beta (β)	t-value	p-value	Empirical Result
H1	ICT Infrastructure → Service Delivery	0.098	1.555	0.122	*Not Supported*
H2	Digital Integration → Service Delivery	0.190	2.312	0.022	**Supported**
H3	Automation → Service Delivery	0.224	2.723	0.007	**Supported**
H4	Interoperability → Service Delivery	0.214	2.952	0.004	**Supported**
H5	Data Sharing → Service Delivery	0.096	1.219	0.225	*Not Supported*
H6	Organizational Challenges → Service Delivery	0.155	2.427	0.016	**Supported**

Table 4.11 Hypothesis Testing Summary Table

ICT Infrastructure → Service Delivery (β = .098, p = .122) — Not Supported

From the regression results, ICT infrastructure was found to be not statistically significantly independent in influencing service delivery (β = .098, p = .122). Therefore, the hypothesis H1 is not supported. Nevertheless, the aforementioned result needs to be understood properly since there is a statistically significant positive relationship between ICT infrastructure and service delivery (r

= .848, p < .001). Thereafter, the loss of the statistical significance of the variable in the regression equation is due to very high multicollinearity (VIF = 5.194), meaning that ICT infrastructure and other dimensions are highly correlated. These findings corroborate the study of Goonatilake (2020) indicating that ICT infrastructure facilitates supply chain efficiency as an enabling factor and not as a driver of performance. Likewise, ICT systems contribute towards speeding up and improving the accuracy of services in African banks but in conjunction with other technology dimensions according to Mndzebele (2013) and Mutua (2017). As evident from the qualitative findings, all the eight managers agreed that ICT infrastructure supports bank processes in CBE but its independent effect is hindered by network connectivity and obsolete ICT infrastructure in use.

Digital Integration → Service Delivery (β = .190, p = .022) — Supported

Statistical analysis confirmed that digital integration was a significant positive predictor of service delivery (β = .190, p = .022). Hence, H2 was supported. This result agrees with the findings by Rajee and Hamed (2018), who noted that digital integration reduces process fragmentation and improves service efficiency by eliminating delays. Similarly, Kache and Seuring (2017) showed that digital integration of supply chains facilitates quickness, accuracy, and effective decision making. In addition, Lim and Palvia (2019) showed that organizations utilizing digital technology provide better service to customers and eliminate process inefficiencies. Findings from the qualitative data analysis support the above results; according to managers, communication between the procurement function and operations was seamless using Oracle software, allowing staff members to concentrate on their customer services roles. Unfortunately, there were still some compatibility issues between Oracle and T-24 systems, indicating that digital integration was a major factor but had not been maximized at CBE.

Automation → Service Delivery (β = .224, p = .007) — Supported

Automation proved to be the most powerful statistically significant predictor of service delivery (β = .224, p = .007) and completely confirms H3. This finding is perfectly aligned with Levary (2020), who stated that automation is the key to enhancing organizational efficiency by minimizing the need for human labor and, consequently, minimizing errors. Several studies investigating the relationship between automation and its effects in the banking sector have found automation to reduce errors, increase accuracy, and positively affect customer experience due to shorter response time (Czvetkó et al., 2022). Morris and Wood (2021) found that the application of automation

enables organizations to maximize customer value by accelerating service delivery. All the participants in qualitative research agreed that automation is essential as it has helped minimize paperwork, reduce errors, and accelerate transaction processing at CBE. Thus, automation becomes one of the main dimensions of adopting technology within the context of CBE's supply chain operations.

Interoperability → Service Delivery (β = .214, p = .004) — Supported

Interoperability emerged as the second most important variable that affects service delivery (β = .214, p = .004), thus verifying H4. The results confirm the theory of Kache and Seuring (2017) that proper system integration ensures a reduction in human error and contributes to increased performance. Moreover, according to Pan et al. (2021), digital interoperability in SCM is crucial for ensuring the coordination necessary to improve service delivery outcomes. The qualitative results help in providing more context because even though the managers agree that communication in core systems is adequate, lack of synchronization between Oracle and T-24 causes inefficiencies and opens up opportunities for fraud. Specifically, one manager stated that interoperability is the most important technology-related variable regarding CBE's service performance.

Data Sharing → Service Delivery (β = .096, p = .225) — Not Supported

As opposed to data sharing, ICT infrastructure was found to be a non-significant predictor of service delivery (β = -1.481, p = .157), thus invalidating H1 in the regression model. However, just like data sharing, this finding should be interpreted with caution as well. First, the bivariate correlation between ICT infrastructure and service delivery proved to be high (r = -.378, p = .027) and the descriptive mean (M = 1.578) indicated that employees highly valued the benefits of having it in place. Second, the non-significance was caused by high levels of multicollinearity (VIF = 4.231). In fact, data sharing was proven to have a substantial amount of common variance with automation and digital integration (VIF = 8.963). As mentioned previously, this finding partly supports Susanne (2021)'s research findings, as it was empirically confirmed that data availability fosters organizational responsiveness. All eight managers agreed that data sharing played an integral role in facilitating customer response time and coordination within the company.

Organizational Challenges → Service Delivery (β = .155, p = .016) — Supported

There was a statistically significant positive association between organizational challenges and service delivery (β = .155, p = .016), thus H6 was supported. This study agrees with Haber and Carmeli (as cited in Pazhanimala, 2023) who reported that developing countries' organizations experience inadequate infrastructural facilities, skill deficiency, poor integration, and change management resistance, influencing their performance in terms of service delivery. Zhu et al. (2006) also highlighted the fact that organizational readiness plays a significant moderating role in the relationship between technology adoption and performance. Noteworthy is the fact that the value of beta is positive, indicating that those employees who are aware of the challenges experienced at the organizational level are the ones dedicated to delivering better services. Based on the thematic analysis findings, some of the major challenges include network outages, skill deficiency, budget constraints, system integration problems, and change management resistance.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter holds the main findings from the quantitative and qualitative data analysis conducted in this study. It starts off with pointing out the outcome with relation to research questions and the pervious literature then continues to conclude the overall study. The chapter concludes with practical recommendations at improving supply chain technology adoption and service delivery at the Commercial Bank of Ethiopia (CBE).

The study looks into how the CBE service delivery are affected by the five dimension of supply chain technology which are ICT infrastructure, Digital Integration, automation, interoperability, and data sharing. It also looked at the organization issues that impact successful adoption of technology. 193 employes provided information Via semi structured and structured questionnaire.

5.2 Summary of Findings

The main point of the study in relation to the six research topics are covered in this part. For a better understanding of how supply chain technology adoption impacts service delivery at CBE this part combines both the statistical findings from multiple linear regression analysis and the qualitative insight obtained from the managerial interview.

5.2.1 The Effect of ICT Infrastructure on Service Delivery

The first research question examined how ICT infrastructure affects service delivery at CBE. The descriptive analysis revealed a mean score of 3.16 (SD = 0.896), indicating that employees hold moderate perceptions of the bank's current ICT infrastructure. While the bivariate Pearson correlation showed a strong positive association between ICT infrastructure and service delivery ($r = .848$, $p < .001$), the multiple regression analysis found that ICT infrastructure was not a statistically significant unique predictor of service delivery when controlling for other variables ($\beta = .098$, $t = 1.555$, $p = .122$). This result shows that even though ICT infrastructure alone has quiet the correlation with service delivery, its main explanatory contribution decreases when the effects of the other technology aspects are taken into consideration. This outcome is aligned with the model's high degree of multicollinearity VIF being 5.194 which shows how linked ICT infrastructure is to the other technological aspects. The qualitative result on the other hand provides

more on the complication. ICT infrastructure greatly facilitates communication, transaction speed and operational coordination based on the interview.

Although several mangers brought up some ideas to enduring issues that hold back the full benefits of ICT infrastructure such as old equipment, system outages, and network problems. Statement such as there being lack of ICT infrastructure due to Resource limitation according to manger 6 and network failure happens almost every day according to manager 7 to these view point ICT infrastructure at CBE is insufficient to independently drive service delivery even though it plays a fundamental role.

These Result mostly align with Goonatilake's (2020) rephrase system efficiency and service speed rely on a solid ICT infrastructure and also they are consistent with the technology Acceptance model which emphasizes the importance of system dependability and usability in choosing the result of technology adoption. What it means is CBE needs to fulfill the needs of ICT infrastructure demand if it wants to gain rewards of the other digital initiatives.

5.2.2 The Effect of Digital Integration on Service Delivery

In the second study question the results in the quantitative analysis showed that system across department were fairly good according to the survey data mean I collected which was 3.38, SD=1.045 digital integration does improve service outcome independent of other aspects as shown by multiple regression analysis which shows that it's a statistically significant positive predictor of service delivery beta = 1.90. On the qualitative side they saw better processes and more smooth communication between the operation and procurement which is done through oracle system which free up employes so they ca focus more on the customer service. They did however draw attention to continues incompatibility between recent software and old systems such as T-24.

These result supports Rajee and hamed's (2018) finding that states digital integration reduce department separation and operation delay. According to my findings CBE existing integration initiative are clearly improving its performance and also some additional fundings would raise service quality.

5.2.3 The Influence of Automation on Service Delivery

Based on the third research question, automation had the highest descriptive score of 3.42 ,SD=1.072 showing high employee acceptability. Mostly automation was found to be the strongest independent and statistically significant predictor of service delivery by multiple regression analysis beta being .224. this number were also supported by qualitative evidence which states that automation has reduced paperwork, lessened human error and increased transaction speed according to all the managers' surveys. Managers noted that it provides more accuracy using T-24 driven automation for cash management and the process of material order via oracle as examples.

The outcomes are consistent with Levary's (2020) findings supporting the operation management ideas that automation increases productivity by eliminating some of the labor manual procedures. And automation is a High priority area for the future technology investment according to the data it has the single largest positive influence on CBE service performance.

5.2.4 The Influence of Interoperability on Service Delivery

Some important points were revealed by the fourth study question which touch on how system interoperability affects CBE service delivery the quantitative result on the descriptive score for interoperability was moderate to good M being 3.38 SD=1.053 and according to regression analysis it was the second most statistically significant predictor of service delivery (beta=.214 t=2.952 p=.004) showing that effective cross system communication does improve service performance. When it came to qualitative result managers noted that there was some gap even though they acknowledge that system communicate well but there are some delays and synchronization problems this gap could result in finical concern such as increase in fraud exposure and service disruption, one manger even said interoperability as the most important aspect.

Literature alignment shows that I consistent with the research by levary (2020) and Kache and seuring (2017) which highlights how efficient system interaction eliminates human error. The information highlights CBE critical strategic requirements to spend money on compatibility solution so to improve its current and legacy platform.

5.2.5 The Role of Data Sharing in Enhancing Service Delivery

On the fifth research question its try to evaluate the impact of data sharing on the quantities side the result was major bivariate correlation r=.878 p<.001 and employes generally had a positive opinion on Realtime data sharing M being 3.41 SD=1.069 still when factors were taken into consideration multiple regression analysis showed that data sharing was not statistically significant independent predictor of service delivery beta was around .096 t=1.219 p=.225 this shows that its advantage are linked to other factors such as automation and digital integration. The qualitative result shows that all eight managers firmly confirmed to usefulness of data sharing , in comparison to regression model they observed that operation ,speed and evidence based decision are enhanced by data sharing according to one manager it is the most significant factor in customer response time.

The result supports Susanne's(2021) claim that real-time data availability promotes responsiveness. The study also comes to conclude that gap between the statistical non implication and the qualitative praise only shows that technological aspect of CBE function as highly interdependent rather than it being as separate instrument.

5.2.6 Challenges Affecting Supply Chain Technology Adoption

Out of the categories examined the descriptive mean for challenges was the lowest M=2.61, SD=0.803 showing that employes don't consider obstacles to be overwhelming strangely a positive correlation with service delivery was revealed by regression analysis beta = .155 t=20427 p=.016 this mostly means that employe who are dedicated to enhancing service delivery are just more aware and outspoken about the difficulties that is there. Qualitative finding obtained through all 8 managers the most important and mentioned the most were technical issues like network outage , system disruption, lack of skilled employees, high maintenance cost, budget constraint.

The findings match with those of Haber and carmeli (2023) who reported that organization in poor nation usually experience integration problem and skill shortage and also infrastructure limitation. The analysis comes to the conclusion that although CBE has achieved quiet the progress the bank is still unable to fulfil its technology aspect due to human resource constraints.

5.3 Conclusions

This research sought to assess the influence of adoption of supply chain technology on service delivery within the Commercial Bank of Ethiopia. It was revealed that the technology dimensions, which include ICT infrastructure, digital integration, automation, interoperability, and data sharing, jointly explain 85.9% of the variability in service delivery, confirming that adoption of supply chain technology is the major strategy influencing the success of the bank. Among the factors, automation was established as the most significant, based on consistent support from quantitative and qualitative sources provided by branch managers. They noted that automation had helped to streamline operations and minimize errors. Interoperability was found to be the second most important factor, owing to the continuous desynchronization issues between the Oracle and T-24 systems. Finally, there was a significant effect of digital integration, despite system incompatibility challenges. Whereas ICT infrastructure and data exchange lacked statistical significance on their own as individual variables, their high correlations and uniform agreement in the qualitative section emphasize their critical importance as facilitating elements in the bigger picture of the technological environment. Issues at the organizational level such as lack of adequate skills, financial constraints, and reluctance to adopt change have also been identified as factors significantly influencing the results of service delivery.

5.4 Recommendations

1. Focus First on Automating High-Volumes of Internal Processes

In view of the fact that automation proved the best predictor of service delivery ($\beta = .224$, $p = .007$), CBE should first and foremost focus its efforts on automating high volumes of internal processes, such as those related to inter-branch procurement, cash handling, and customer transactions. This could be done through extending the capacity for automation currently provided by the T-24 system and the deployment of RPA systems in back-office functions.

2. Close the Gap in Interoperability between Oracle and T-24 Systems

Given that interoperability is the second most powerful predictor of service delivery ($\beta = .214$, $p = .004$), and that all managers highlighted interoperability between Oracle-T24 as one of the most important risks facing the firm's operations, CBE must quickly come up with an approach for designing standardized APIs for the two main banking systems used by the firm.

3. Strengthen ICT Infrastructure as an Essential Foundation

Considering that network instability and lack of power were mentioned as the main obstacles to effective technology operations by all eight managers, the bank should ensure that there are adequate redundancies in terms of fiber connections, UPS capabilities, and hardware updates at all locations. The reason why this is important is that the ICT infrastructure underlies all other aspects of technology deployment.

4. Develop Digital Competencies through Training

Having recognized that skill shortages were a major issue in CBE, and had affected the services provided by CBE, it would be advisable for CBE to develop a training program to ensure that their employees have the required skills and knowledge to effectively operate digital systems, manage data, and be mindful of cybersecurity. CBE can also consider hiring specialists in information technology.

5. Create Centralized Data Governance

With the high-quality qualitative approval for the necessity of data sharing, CBE needs to develop a centralized data governance model which will ensure quality, security, and timely availability of data for each and every branch. The data governance model will help in creating a structure for the ownership and access to data and standardize reporting.

6. Set a Dedicated & Increasing Technology Budget

Given that budget limitations were mentioned repeatedly as a deterrent to using technologies, CBE must have a separate technology investment budget which is increasing yearly in accordance with the bank's strategic plan. The budget should focus on the following aspects of technology discussed in this report, where automation, interoperability, and digitalization should receive more funding because of the effects on services.

- **Recommendations for Future Research**

This study opens several avenues for future research. First, future studies should examine the causal mechanisms tthrough which individual technology dimensions influence service delivery using longitudinal or experimental research designs that allow for stronger causal inference beyond the correlational findings of this study. Second, researchers should investigate whether the findings

are generalizable to private Ethiopian banks, microfinance institutionns, and other public service organizations operating in developing country contexts. Third, future studies should eexplore the moderating effects of organizationall culture, leadership style, and regulatory environment on the relationship between supply chain technology adoption and service delivery. Fourth, given the high multicollinearity detected in this study, future research could benefit from applying structural equation modeling (SEM) to better capture the complex, interdependent relationships among the technology dimensions. Finally, studies exploring the customer-side perspective of technology-enabled service delivery at CBE would provide a valuable complementary assessment of the impact reported here from the employee perspective.

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APPENDIX 1

Questionnaire

ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCOOL OF COMMERCE MA in Logistics and Supply Chain Management

The Role of Supply Chain Technology Adoption Enhancing Service Delivery: The Case of Commercial Bank of Ethiopia

Questionnaire

Dear respondents, this questionnaire is designed to collect data for academic research. The purpose is to examine how supply chain technology adoption affects service delivery. Your responses will be kept confidential and used only for research purposes. I kindly request you answer each item of the questionnaire very carefully because your response will highly determine the reliability of the study.

Please do not hesitate to reach out to me if you have any questions and comments about the questionnaire.

Name: Amanuel Million **Phone Number**: +251 922 777857

General Instructions

- You are not required to write your name
- Please tick (√) for the answer in the appropriate box

INSTRUCTION

Please indicate your level of agreement using the following scale:

Scale	Meaning
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

PART I: QUESTIONNAIRE FOR EMPLOYEES

SECTION A: DEMOGRAPHIC INFORMATION

Gender: ☐ Male ☐ Female

Age: ☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46+

Education Level: ☐ Diploma ☐ Degree ☐ Master's ☐ Other

Work Experience: ☐ <2 yrs ☐ 2–5 yrs ☐ 6–10 yrs ☐ >10 yrs

Department: ☐ Procurement ☐ Logistics ☐ Operations ☐ Other

SECTION B: ICT INFRASTRUCTURE

No	**Statement**	**1**	**2**	**3**	**4**	**5**
B1	The bank provides reliable IT systems for daily operations.	☐	☐	☐	☐	☐
B2	Internet and system connectivity are stable.	☐	☐	☐	☐	☐

No	Statement	1	2	3	4	5
B3	System downtime rarely disrupts my work.	☐	☐	☐	☐	☐
B4	ICT infrastructure supports efficient service delivery.	☐	☐	☐	☐	☐
B5	ICT infrastructure improves service speed.	☐	☐	☐	☐	☐
B6	ICT infrastructure improves service accuracy.	☐	☐	☐	☐	☐

SECTION C: DIGITAL INTEGRATION

No	Statement	1	2	3	4	5
C1	Systems across departments are well integrated.	☐	☐	☐	☐	☐
C2	Information flows smoothly between departments.	☐	☐	☐	☐	☐
C3	Integration reduces operational delays.	☐	☐	☐	☐	☐
C4	Systems support coordination between units.	☐	☐	☐	☐	☐
C5	Digital integration improves service speed.	☐	☐	☐	☐	☐
C6	Digital integration improves service reliability.	☐	☐	☐	☐	☐

SECTION D: AUTOMATION

No	Statement	1	2	3	4	5
D1	Many processes are automated.	☐	☐	☐	☐	☐
D2	Automation reduces manual work.	☐	☐	☐	☐	☐
D3	Automation improves accuracy.	☐	☐	☐	☐	☐

No	Statement	1	2	3	4	5
D4	Automation increases efficiency.	☐	☐	☐	☐	☐
D5	Automation reduces service delivery time.	☐	☐	☐	☐	☐
D6	Automation improves customer satisfaction.	☐	☐	☐	☐	☐

SECTION E: INTEROPERABILITY (Compatibility)

No	Statement	1	2	3	4	5
E1	Systems can communicate effectively.	☐	☐	☐	☐	☐
E2	I can easily access information across systems.	☐	☐	☐	☐	☐
E3	System compatibility issues are minimal.	☐	☐	☐	☐	☐
E4	Interoperability improves workflow.	☐	☐	☐	☐	☐
E5	Interoperability improves service speed.	☐	☐	☐	☐	☐
E6	Interoperability improves service reliability.	☐	☐	☐	☐	☐

SECTION F: DATA SHARING

No	Statement	1	2	3	4	5
F1	I can access real-time data when needed.	☐	☐	☐	☐	☐
F2	Data sharing between departments is effective.	☐	☐	☐	☐	☐
F3	Information is accurate and reliable.	☐	☐	☐	☐	☐
F4	Systems support decision-making.	☐	☐	☐	☐	☐

No	Statement	1	2	3	4	5
F5	Data sharing improves responsiveness to customers.	☐	☐	☐	☐	☐
F6	Data sharing improves service efficiency.	☐	☐	☐	☐	☐

SECTION G: SERVICE DELIVERY

No	Statement	1	2	3	4	5
G1	Services are delivered quickly.	☐	☐	☐	☐	☐
G2	Transactions are processed accurately.	☐	☐	☐	☐	☐
G3	Services are reliable and consistent.	☐	☐	☐	☐	☐
G4	Customers are satisfied with services.	☐	☐	☐	☐	☐
G5	The bank responds quickly to customer needs.	☐	☐	☐	☐	☐

SECTION H: CHALLENGES OF TECHNOLOGY ADOPTION

No	Statement	1	2	3	4	5
H1	Lack of training limits effective use of technology.	☐	☐	☐	☐	☐
H2	System failures disrupt service delivery.	☐	☐	☐	☐	☐
H3	Resistance to change affects technology adoption.	☐	☐	☐	☐	☐
H4	Poor system integration affects performance.	☐	☐	☐	☐	☐
H5	Lack of technical support limits system usage.	☐	☐	☐	☐	☐
H6	High-cost limits effective technology implementation.	☐	☐	☐	☐	☐

APPENDIX 2

Interview Questions

Interview on the Role of Supply Chain Technology Adoption in Enhancing Service Delivery at the Commercial Bank of Ethiopia

INTERVIEW FOR MANAGERS

SECTION A: BACKGROUND

Position:

Years of experience:

Branch / Headquarters:

SECTION B: ICT INFRASTRUCTURE

1. How does ICT infrastructure affect service delivery?
2. Is the current infrastructure sufficient? Why/why not?

SECTION C: DIGITAL INTEGRATION

1. How well are systems integrated across departments?
2. What integration challenges exist?

SECTION D: AUTOMATION

1. How does automation affect efficiency and service delivery?

SECTION E: INTEROPERABILITY (compatibility)

1. Do systems communicate effectively?
2. What problems arise from lack of interoperability?

SECTION F: DATA SHARING

1. How effective is data sharing across departments?

2. How does it influence decision-making and service delivery?

SECTION G: SERVICE DELIVERY

1. How has technology adoption changed service delivery?
2. Which dimension has the greatest impact? Is it IT infrastructure, automation, data sharing, data integration, or compatibility?

SECTION H: CHALLENGES

1. What are the major challenges in adopting supply chain technologies?
2. What limits effective implementation?
3. What improvements would you recommend?